GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE

McFarland Johnson

Table of Contents

Chapter 1 – Introduction

1. Introduction 1-1
1.1. Airport Background 1-1
1.1.1. Airport History 1-1
1.1.2. Airport Role 1-1
1.1.3. Greenville-Spartanburg Airport Commission 1-2
1.1.4. Airport Strategy 1-2
1.2. Keys to a Successful Master Plan 1-3
1.2.1. Master Plan Goals and Objectives 1-3
1.3. Review of Existing Studies 1-5
1.3.1. Previous Airport Master Plan 1-5
1.3.2. Terminal Area Study and Wingspan 1-5
1.3.3. Landscape Master Plan 1-5
1.3.4. Master Land Use and Commercial Development Study 1-6
1.3.5. I-85 Corridor Analysis and Widening Project 1-6
1.4. Conclusion 1-6

Chapter 2 – Inventory

2. Inventory 2-1
2.1. Airport Location 2-1
2.1.1. Airport Service Area 2-1
2.1.2. Meteorological Conditions and Climate 2-6
2.2. Airfield Facilities 2-10
2.2.1. Runways 2-10
2.2.2. Taxiways and Taxilanes 2-13
2.2.3. Apron Areas 2-15
2.2.4. Pavement Management 2-16
2.2.5. Instrumentation, Visual and Navigational Aids 2-16
2.3. Airspace Procedures and Air Traffic Control 2-26
2.3.1. Air Traffic Control Facilities 2-29
2.4. Landside Facilities 2-30
2.4.1. Passenger Terminal Facilities 2-30
2.4.2. General Aviation Facilities 2-49
2.4.3. Cargo Facilities 2-50
2.4.4. Airport Support Facilities 2-51
2.4.5. Utility Infrastructure 2-53
2.4.6. Regional Access, Airport Parking and Ground Transportation 2-57
2.5. Airport Tenants 2-64
2.5.1. Cerulean Aviation 2-64

2.5.2. Federal Aviation Administration 2-66
2.5.3. National Weather Service – National Oceanic and Atmospheric Administration (NOAA) 2-66
2.5.4. Cargo and Freight 2-66
2.5.5. Industrial Park Road Complex 2-67
2.6. Airport Land Use Patterns 2-68
2.6.1. Airport Area Land Use 2-68
2.6.2. Airport Area Zoning 2-68
2.6.3. Airport Master Land Use and Development Plan 2-71
2.7. Airport Community Surveys 2-73
2.8. Conclusion 2-74

Chapter 3 – Aviation Forecasts

3. Aviation Forecasts 3-1
3.1. Introduction 3-1
3.2. Forecast Influencing Factors 3-2
3.2.1. Service Area 3-2
3.2.2. Aviation Industry 3-2
3.3. Socioeconomic Trends 3-3
3.3.1. Population 3-4
3.3.2. Employment 3-5
3.3.3. Per Capita Personal Income 3-5
3.4. Passenger Enplanements 3-6
3.4.1. Historical Activity 3-6
3.4.2. Existing Forecasts 3-7
3.4.3. Forecast Methodologies 3-8
3.4.4. Air Service Analysis 3-9
3.4.5. Selected Forecast 3-14
3.4.6. Derivative Forecast Scenarios 3-14
3.4.7. Peak Hour Enplanements/Peaking Characteristics 3-15
3.5. Air Cargo 3-16
3.6. Aircraft Operations 3-18
3.6.1. Historical Activity 3-19
3.6.2. Growth Elements 3-20
3.6.3. Air Carrier and Air Taxi 3-21
3.6.4. General Aviation Operations 3-21
3.6.5. Military Operations 3-22
3.6.6. Aircraft Fleet Mix 3-22
3.6.7. Peaking Characteristics – Aircraft Operations 3-23
3.7. Based Aircraft 3-24
3.8. Forecast Summary 3-25
3.8.1. Comparison with FAA Terminal Area Forecast 3-25
3.9. Future Design Aircraft 3-26

3.10. Long Range Planning 3-27

Chapter 4 – Environmental Overview

4. Environmental Overview 1
4.1. Introduction 1
4.2. Biotic Resources 2
4.2.1. Ecological Communities 2
4.2.2. Flora and Fauna 2
4.3. Water Resources 4
4.3.1. Groundwater 4
4.3.2. Wetlands 4
4.3.3. Surface Waters 8
4.3.4. Wild and Scenic Rivers 8
4.3.5. Floodplains 9
4.4. Coastal Resources 9
4.5. Department Of Transportation Section 4(F) Resources 11
4.6. Historical, Architectrual, Archaeological, and Cultural Resources 11
4.7. Farmlands 11
4.8. Land Use 12
4.9. Noise and Noise-Compatible Land Use 13
4.10. Visual Effects 16
4.10.1. Light Emissions 16
4.10.2. Visual Resources and Character 16
4.11. Air Quality 16
4.12. Hazardous Materials, Solid Waste, and Pollution Prevention 17
4.12.1. Hazardous Waste 17
4.12.2. Solid Waste 17
4.12.3. Pollution Prevention 18
4.12.4. Stormwater 18
4.13. Energy Supplies and Natural Resources 19
4.14. Climate 19
4.15. Socioeconmics, Environmental Justice, and Children's Environmental Health and Safety Risks 19
4.15.1. Socioeconomics 19
4.15.2. Environmental Justice 20
4.15.3. Children's Environmental Health and Safety Risks 21
4.16. Airport Recycling, Reuse and Waste Reduction 22
4.16.1. Existing Waste Sources 22
4.16.2. Local Recycling and Waste Management Programs 23
4.16.3. Overview of Airport Recycling, Reuse, and Waste Management Practices and Opportunities 23

Chapter 5 – Facility Requirements

5. Facility Requirements 5-1
5.1. Airport Capacity 5-1
5.1.1. Airspace Capacity Analysis 5-1
5.1.2. Airfield Capacity Analysis 5-2
5.1.3. Capacity Calculations 5-8
5.2. Airside Facility Requirements 5-10
5.2.1. Critical Design Aircraft and Runway Design Code 5-10
5.2.2. Pavement Condition 5-10
5.2.3. Runway Length 5-11
5.2.4. Runway Width 5-12
5.2.5. Runway Orientation 5-13
5.2.6. Runway Designation 5-13
5.2.7. Runway Critical Areas 5-14
5.2.8. Runway Pavement Markings 5-18
5.2.9. Taxiway and Taxilane System 5-18
5.2.10. Airfield Lighting and Signage 5-27
5.2.11. Visual Approach Aids 5-27
5.2.12. Airfield Facility Requirements Summary 5-28
5.3. Passenger Terminal Facility Requirements 5-29
5.3.1. Existing Passenger Terminal 5-30
5.3.2. Methodology 5-30
5.3.3. Assumptions 5-32
5.3.4. Results of Analysis 5-37
5.4. Roadway Access and Parking Facility Requirements 5-41
5.4.1. Airport Roadway and Circulation Assessment 5-41
5.4.2. On-Site Parking and Facility Assessment 5-64
5.4.3. Summary of Roadway Access and Parking Facility Requirements 5-68
5.5. Air Cargo Facility Requirements 5-69
5.5.1. Near-Term Cargo Facility Developments 5-69
5.5.2. Methodology 5-69
5.5.3. Assumptions 5-69
5.5.4. Results of Analysis 5-71
5.6. General Aviation Facility Requirements 5-72
5.6.1. Aircraft Hangars 5-72
5.6.2. Aircraft Aprons 5-74
5.6.3. General Aviation Terminal and FBO Facilities 5-76
5.6.4. General Aviation Access and Auto Parking 5-77
5.6.5. General Aviation Facility Requirements Summary 5-77
5.7. Airport Support Facility Requirements 5-78
5.7.1. Air Traffic Control Tower (ATCT) 5-78
5.7.2. Aircraft Rescue and Fire Fighting (ARFF) 5-78
5.7.3. Airfield Maintenance Facility and Equipment 5-79

5.7.4. Aviation Fuel Storage and Distribution 5-80
5.7.5. Support Facility Requirements Summary 5-80
5.8. Forecast Scenario Facility Requirements 5-81
5.8.1. New Ultra Low-Cost Carrier (ULCC) Service 5-81
5.8.2. New LCC Service 5-81
5.8.3. New International Service 5-82
5.8.4. Market Interruption 5-82
5.8.5. Enhanced Aircraft Up-gauging 5-83
5.9. Facility Requirement Summary 5-83

Chapter 6 – Alternatives

6. Alternatives 6-1
6.1. Identification of Development Alternatives 6-1
6.1.1. Airside Alternatives 6-2
6.1.2. Terminal Airside Alternatives 6-31
6.1.3. Landside Access and Parking Alternatives 6-50
6.1.4. Air Cargo Facility Alternatives 6-79
6.1.5. General Aviation Facility Alternatives 6-83
6.1.6. Other Aviation Development Properties 6-84
6.1.7. Support Facility Alternatives 6-89
6.2. Refinement and Evaluation of Development Alternatives 6-100
6.2.1. Evaluation Criteria 6-100
6.2.2. Refined Alternatives and Evaluation 6-101
6.2.3. Non-Aviation Land Use Considerations 6-155
6.3. Selected Airport Development Plan 6-163

Chapter 7 – Implementation Plan

7. Implementation Plan 7-1
7.1. Overview 7-1
7.2. Sources of Capital Funding 7-1
7.2.1. FAA Grant Funding 7-2
7.2.2. Cargo Service Funding 7-2
7.2.3. South Carolina Aeronautics Commission Funding 7-2
7.2.4. Local Funding Options 7-3
7.3. Airport Capital Improvement Plan (ACIP) 7-5
7.3.1. Order of Magnitude Cost Estimates 7-5
7.3.2. Project Phasing Periods 7-5

Chapter 8 – Financial

8. Financial 8-1
8.1. Short-Term ACIP Project Costs 8-1
8.2. Airport Financial Analysis 8-2

8.2.1. Airport Revenues from Lease Agreements and Tenant Fees 8-2
8.2.2. Historical Operating Revenues and Expenses 8-3
8.2.3. Forecast of Baseline Airport Operating Financial Performance 8-5
8.2.4. Forecast of Preferred Development Operating Financial Performance 8-7
8.3. Summary of the Short-Term Capital Program Funding Feasibility 8-9
8.4. Airport Governance and Policy Considerations 8-10
8.4.1. Airport Governance and Financial Structure 8-10
8.4.2. Commercial and General Aviation Business Policies 8-11
8.4.3. Use and Lease Agreements 8-12

Chapter 9 - ALP Summary

9. ALP Summary 9-1
9.1. Cover Sheet 9-1
9.2. Existing Airport Layout 9-2
9.3. Airport Layout Plan 9-2
9.4. Airport Data Sheet 9-2
9.5. Terminal Area Plan 9-2
9.6. Airport Airspace Plans 9-2
9.6.1. Primary Surface 9-3
9.6.2. Transitional Surface 9-3
9.6.3. Approach Surface 9-3
9.6.4. Horizontal Surface 9-3
9.6.5. Conical Surface 9-3
9.7. Inner Approach Plans 9-3
9.8. Departure Surface Plans 9-4
9.9. Airport Land Use and RPZ Control Plan 9-4
9.10. Airport Property Map 9-5

Appendix A - Pavement Management Plan

Appendix B - Traffic Count Study

Appendix C - Airport Community Survey

Appendix D - Cost Estimates

List of Tables

Chapter 2 – Inventory

Table 2-1 : Commercial Service Airports Near GSP 2-4
Table 2-2 : General Aviation Airports Near GSP 2-6
Table 2-3 : Wind Data for Runway 4-22 2-7
Table 2-4 : Wind Coverage by Runway End 2-7
Table 2-5 : GSP Instrument Procedures Approach Minima 2-17
Table 2-6 : Commercial Terminal Airline Space Allocation 2-43
Table 2-7 : Commercial Terminal Concessionaire Space 2-45
Table 2-8 : Commercial Terminal Public Areas 2-47
Table 2-9 : Commercial Terminal Non-Public Areas 2-47
Table 2-10 : GA Hangars 2-50
Table 2-11 : Airport Parking Summary 2-64
Table 2-12 : Airport Master Land Use and Development Plan Tracts 2-72

Chapter 3 – Aviation Forecasts

Table 3-1 : Historical and Forecast Percentages of Growth in Population 3-4
Table 3-2 : Historical and Forecast Percentages of Total Employment 3-5
Table 3-3 : Historical and Forecast Total Percentages of PCPI 3-5
Table 3-4 : Historical Passenger Enplanements 3-7
Table 3-5 : Existing GSP Forecasts 3-8
Table 3-6 : Forecast Enplanements by Methodology 3-9
Table 3-7 : Historical Air Service Activity 3-11
Table 3-8 : Projected Air Service Activity 3-13
Table 3-9 : Baseline Enplanement Forecast 3-14
Table 3-10 : New Service Derivative Scenarios 3-15
Table 3-11 : Enhanced Aircraft Upgauging Scenario 3-15
Table 3-12 : Peak Enplanement Characteristics 3-16
Table 3-13 : Historical Cargo Demand 3-17
Table 3-14 : Forecast Air Cargo Activity 3-18
Table 3-15 : Historical Aircraft Operations 3-20
Table 3-16 : Annual Operations Forecast by Type 3-22
Table 3-17 : Aircraft Fleet Mix 3-23
Table 3-18 : Peak Hour Operations 3-24
Table 3-19 : Based Aircraft Forecast 3-25
Table 3-20 Aviation Demand Forecast Summary 3-25
Table 3-21 : Aviation Demand Forecast vs. FAA Terminal Area Forecast 3-26
Table 3-22 : FAA Airport Reference Code 3-27
Table 3-23 : Future Design Aircraft 3-27
Table 3-24 : Long Range Planning Forecast 3-27

Chapter 4 – Environmental Overview

Table 4-1 : State Listed Threatened and Endangered Species 3
Table 4-2 : Federally Listed Threatened and Endangered Species 4
Table 4-3 : Typical Outdoor Day-Night Noise Levels 13
Table 4-4 : Land Use Compatibility 14
Table 4-5 : Waste Sources and Control 23

Chapter 5 – Facility Requirements

Table 5-1 : Aircraft Fleet Mix 5-6
Table 5-2 : Exit Taxiway Distance from Threshold 5-7
Table 5-3 : Exit Taxiway Cumulative Utilization Percentage 5-7
Table 5-4 : Runway 4 Exit Taxiway Usage Per Conditions 5-8
Table 5-5 : Runway 22 Exit Taxiway Usage Per Conditions 5-8
Table 5-6 : Annual Operations Forecast 5-9
Table 5-7 : Runway Designation Calculation 5-13
Table 5-8 : RPZ Dimensions Per Runway End 5-18
Table 5-9 : Taxiway Requirements – Airplane Design Group 5-19
Table 5-10 : Taxiway Requirements – Taxiway Design Group 5-19
Table 5-11 : Geometry Issues at GSP 5-23
Table 5-12 : Summary of Airside Facility Requirements 5-28
Table 5-13 : Aircraft Seats and Scheduling Peak Characteristics 5-31
Table 5-14 : Peak Hour Vehicle Assumptions 5-33
Table 5-15 : Outbound Baggage and Screening System Assumptions 5-34
Table 5-16 : Terminal Functional Area Requirements 5-38
Table 5-17 : Roadway Existing Conditions Level of Service Table 5-54
Table 5-18 : Roadway Future Conditions Level Of Service 5-56
Table 5-19 : Roadway Access Performance Key Findings 5-63
Table 5-20 : Parking Facilities Overview 5-64
Table 5-21 : Parking and Facilities Performance Key Findings 5-65
Table 5-22 : Passenger Demand Factors 5-66
Table 5-23 : Peak Passenger Parking Demand 5-66
Table 5-24 : Parking and Roadway Access Facility Requirements Summary 5-68
Table 5-25 : Air Cargo Building/Warehouse Ratio Inputs 5-70
Table 5-26 : Air Cargo Apron Parking Requirements 5-70
Table 5-27 : Air Cargo Building/Warehouse Ratio Inputs 5-71
Table 5-28 : Air Cargo Facility Requirements Summary 5-71
Table 5-29 : Existing Hangar Facilities 5-72
Table 5-30 : Aircraft Hangar Demand 5-74
Table 5-31 : Apron Parking Demand 5-75
Table 5-32 : GA Terminal Gross Area Analysis 5-76
Table 5-33 : GA FBO Auto Parking 5-77
Table 5-34 : General Aviation Facility Requirements Summary 5-78
Table 5-35 : Airport Fuel Sale Projection – Jet-A 5-80
Table 5-36 : Airport Fuel Sale Projection – AvGas 5-80

Table 5-37 : Support Facility Requirements Summary 5-81
Table 5-38 : Facility Requirements Total Summary 5-83

Chapter 6 – Alternatives

Table 6-1 : Identified Airside Alternatives 6-5
Table 6-2 : Identified Terminal Airside Alternatives 6-33
Table 6-3 : Identified Landside Access Alternatives 6-51
Table 6-4 : Identified Air Cargo Facility Alternatives 6-83
Table 6-5 : General Aviation Facility Requirements 6-84
Table 6-6 : Identified General Aviation Facility Alternatives 6-84
Table 6-7 : Identified West Side Aviation Facility Alternatives 6-89
Table 6-8 : Identified South Side Aviation Facility Alternatives 6-89
Table 6-9 : Support Facility Requirements 6-100
Table 6-10 : Identified Support Facility Alternatives 6-100
Table 6-11 : Retained and Refined Airside Alternatives 6-102
Table 6-12 : Airfield Alternative Evaluation 6-109
Table 6-13 : Retained and Refined Terminal Airside Alternatives 6-113
Table 6-14 : Terminal Airside Alternative Evaluation 6-123
Table 6-15 : Retained and Refined Landside Access Alternatives 6-127
Table 6-16 : Landside Access Alternative Evaluation 6-128
Table 6-17 : Retained and Refined Air Cargo Facility Alternatives 6-151
Table 6-18 : Retained and Refined General Aviation Facility Alternatives 6-151
Table 6-19 : Retained and Refined Westside Aviation Alternatives 6-155

Chapter 7 – Implementation Plan

Table 7-1 : Airport Capital Improvement Program – Phase One 7-6
Table 7-2 : Airport Capital Improvement Program – Phase Two 7-13
Table 7-3 : Airport Capital Improvement Program – Phase Three 7-19
Table 7-4 : Airport Capital Improvement Program – Phase Four 7-24

Chapter 8 – Financial

Table 8-1 : Short Term Capital Project Costs 8-1
Table 8-2 : Snapshot of Facility Rents & Tenant Fees 8-2
Table 8-3 : Snapshot of FBO Operations Revenue Streams 8-3
Table 8-4 : Historical Operating Revenues and Expenses 8-4
Table 8-5 : Baseline Forecast of Airport Operating Financial Performance 8-6
Table 8-6 : Baseline Net Operating Income/(Deficit) Summary 8-6
Table 8-7 : Forecasted Activities Implementation Timeline 8-7
Table 8-8 : Forecast of Preferred Development Operating Financial Performance 8-8
Table 8-9 : Preferred Alternative Net Operating Income/(Deficit) Summary 8-9
Table 8-10 : Estimated ACIP Short Term Local Funding Need 8-9

List of Figures

Chapter 2 – Inventory

Figure 2-1 : Airport Location Map 2-2
Figure 2-2 : Airport Vicinity Map 2-3
Figure 2-3 : Airport Service Area Drive Time Map 2-5
Figure 2-4 : All Weather Wind Rose 2-8
Figure 2-5 : IFR Wind Rose 2-9
Figure 2-6 : Airfield Facilities 2-11
Figure 2-7 : Runway 22 ILS or LOC 2-18
Figure 2-8 : Runway 4 ILS or LOC/DME 2-19
Figure 2-9 : Runway 4 ILS 2-20
Figure 2-10 : Runway 4 (CAT II and III) 2-21
Figure 2-11 : Runway 4 RNAV (GPS) 2-23
Figure 2-12 : Runway 22 RNAV (GPS) 2-24
Figure 2-13 : Generalized Airspace Schematic 2-27
Figure 2-14 : GSP Airspace 2-28
Figure 2-15 : Landside Facilities 2-33
Figure 2-16 : Commercial Terminal 1st Floor ("Ticketing Level") 2-37
Figure 2-17 : Commercial Terminal 2nd Floor ("Apron Level") 2-39
Figure 2-18 : Commercial Terminal 3rd Floor ("Concourse Level") 2-41
Figure 2-19 : Concourse and Gate Diagram 2-48
Figure 2-20 : Infrastructure and Utilities 2-55
Figure 2-21 : Airport Access, Ground Transportation and Parking Facilities 2-59
Figure 2-22 : Industrial Park Road Buildings 2-67
Figure 2-23 : Land Use Map 2-69
Figure 2-24 : Zoning Map 2-70
Figure 2-25 : Airport Master Land Use and Development Plan Tracts 2-73

Chapter 3 – Aviation Forecasts

Figure 3-1 : Historical Passenger Enplanements 3-6
Figure 3-2 : Historical Aircraft Operations 3-19

Chapter 4 – Environmental Overview

Figure 4-1 : National Wetland Inventory Map 6
Figure 4-2 : Preferred Wetland Mitigation Option Hierarchy 7
Figure 4-3 : FEMA Floodplain Map 10
Figure 4-4 : Noise Contour Map 15
Figure 4-5 : Demographic Profile Comparison Graph 21

Chapter 5 – Facility Requirements

Figure 5-1 : VFR Sectional Chart – Atlanta 5-3
Figure 5-2 : Airfield Topography and Slope Analysis 5-15

Figure 5-3 : Taxiway Design Groups 5-19
Figure 5-4 : Inadvisable Rapid-Exit Taxiway Design 5-24
Figure 5-5 : Taxiway Intersection Fillet Analysis 5-25
Figure 5-6 : IATA Level of Service Performance Categories 5-32
Figure 5-7 : Existing Terminal Curb 5-41
Figure 5-8 : Traffic Analysis Study Area 5-43
Figure 5-9 : 2017 Daily Traffic Variation 5-45
Figure 5-10 : 90th Percentile Weekday AM Peak Volumes 7:30-8:30 5-47
Figure 5-11 : 90th Percentile Weekday AM Peak Volumes 8:45-9:45 5-49
Figure 5-12 : 90th Percentile Weekday PM Peak Volumes 4:30-5:30 5-51
Figure 5-13 : Airport-Related Traffic by Destination 5-53
Figure 5-14 : 3 Million Enplanements AM Peak Volumes 7:30-8:30 5-57
Figure 5-15 : 3 Million Enplanements AM Peak Volumes 8:45-9:45 5-59
Figure 5-16 : 3 Million Enplanements PM Peak Volumes 4:30-5:30 5-61

Chapter 6 – Alternatives

Figure 6-1 : Alternative Identification and Refinement Flow Chart 6-2
Figure 6-2 : Parallel Runway Alternative 1 6-7
Figure 6-3 : Parallel Runway Alternative 2 6-9
Figure 6-4 : Parallel Runway Alternative 3 6-11
Figure 6-5 : Crossfield Taxiway Alternative 1 6-13
Figure 6-6 : Crossfield Taxiway Alternative 2 6-14
Figure 6-7 : Crossfield Taxiway Alternative 3 6-15
Figure 6-8 : Taxiway F Removal 6-17
Figure 6-9 : Taxiway E & F Removal 6-17
Figure 6-10 : Relocated Taxiway F South 6-17
Figure 6-11 : Taxiway E & F Replacement with 90° Connector Taxiway 6-17
Figure 6-12 : Relocated Taxiway F North 6-17
Figure 6-13 : Relocated Taxiway L2 South 6-19
Figure 6-14 : Relocated Taxiway L2 North 6-19
Figure 6-15 : Taxiway Filet Widening for TDG-6 on Taxiway A/B/J/K 6-21
Figure 6-16 : Apron Edge Taxilane Alternative 1 6-23
Figure 6-17 : Apron Edge Taxilane Alternative 2 6-23
Figure 6-18 : Apron Edge Taxilane Alternative 3 6-25
Figure 6-19 : Apron Edge Taxilane Alternative 4 6-25
Figure 6-20 : Runway 22 ALSF-2 6-27
Figure 6-21 : Taxiway H Alternative 6-29
Figure 6-22 : Taxiway L9 Realignment 6-30
Figure 6-23 : Terminal Alternative A1 - Ground 6-34
Figure 6-24 : Terminal Alternative A1 – International 6-35
Figure 6-25 : Terminal Alternative A2 6-36
Figure 6-26 : Terminal Alternative A3 – Ground 6-37
Figure 6-27 : Terminal Alternative A3 – International 6-38
Figure 6-28 : Terminal Alternative A4 – Ground 6-39

Figure 6-29 : Terminal Alternative A4 – International 6-40
Figure 6-30 : Terminal Alternative A5 – International 6-41
Figure 6-31 : Terminal Alternative A6 – Ground 6-42
Figure 6-32 : Terminal Alternative A6 – International 6-43
Figure 6-33 : Terminal Alternative B1 – Ground 6-44
Figure 6-34 : Terminal Alternative B1 – International 6-45
Figure 6-35 : Terminal Alternative B2 – Ground 6-46
Figure 6-36 : Terminal Alternative B2 – International 6-47
Figure 6-37 : Terminal Alternative B3 – Domestic 6-48
Figure 6-38 : Terminal Alternative B3 – International 6-49
Figure 6-39 : Landside Access Alternative 1A 6-53
Figure 6-40 : Landside Access Alternative 1B 6-55
Figure 6-41 : Landside Access Alternative 1C 6-57
Figure 6-42 : Landside Access Alternative 1D 6-59
Figure 6-43 : Landside Access Alternative 1E 6-61
Figure 6-44 : Landside Access Alternative 2A 6-63
Figure 6-45 : Landside Access Alternative 2B 6-65
Figure 6-46 : Landside Access Alternative 2C 6-67
Figure 6-47 : Landside Access Alternative 2D 6-69
Figure 6-48 : Landside Access Alternative 3A 6-71
Figure 6-49 : Landside Access Alternative 3B 6-73
Figure 6-50 : Landside Access Alternative 3C 6-75
Figure 6-51 : Landside Access Alternative 3D 6-77
Figure 6-52 : Airside Cargo Alternative 1 6-80
Figure 6-53 : Airside Cargo Alternative 2 6-81
Figure 6-54 : Airside Cargo Alternative 3 6-82
Figure 6-55 : GA Development Area Alternative 1 6-85
Figure 6-56 : GA Development Alternative Area 2 6-87
Figure 6-57 : West Side Aviation Development Area 1 6-91
Figure 6-58 : West Side Aviation Development Area 2 6-93
Figure 6-59 : South Side Aviation Development Area 1 6-95
Figure 6-60 : Fuel Farm Expansion Alternative 6-97
Figure 6-61 : Maintenance Yard Expansion 6-98
Figure 6-62 : Potential Ground Run Up Enclosure Site 6-99
Figure 6-63 : Refined Crossfield Taxiway Alternative 1 6-103
Figure 6-64 : Refined Crossfield Taxiway Alternative 2 6-104
Figure 6-65 : Refined Crossfield Taxiway Alternative 3 6-105
Figure 6-66 : Refined Apron Edge Taxilane Alternative 6-107
Figure 6-67 : Preferred Airfield Alternative 6-111
Figure 6-68 : Refined Terminal Alternative 1 6-115
Figure 6-69 : Refined Terminal Alternative 2 6-116
Figure 6-70 : Refined Terminal Alternative 3 6-117
Figure 6-71 : Refined Terminal Alternative 4 6-118
Figure 6-72 : Refined Terminal Alternative 5 6-119

Figure 6-73 : Refined Terminal Alternative 6 6-120
Figure 6-74 : Beyond Planning Period Terminal Alternative 1 6-121
Figure 6-75 : Beyond Planning Period Terminal Alternative 2 6-122
Figure 6-76 : Preferred Terminal Airside Development 6-125
Figure 6-77 : Refined Landside Access Alternative 1E 6-129
Figure 6-78 : New Landside Access Alternative 1F 6-131
Figure 6-79 : Refined Landside Access Alternative 2D 6-133
Figure 6-80 : Terminal Curbside Lane Configuration Alternative 1 6-137
Figure 6-81 : Terminal Curbside Lane Configuration Alternative 2 6-139
Figure 6-82 : Terminal Curbside Lane Configuration Alternative 3 6-141
Figure 6-83 : PRT Alignment Alternative 1 6-143
Figure 6-84 : PRT Alignment Alternative 2 6-145
Figure 6-85 : PRT Alignment Alternative 3 6-147
Figure 6-86 : PRT Alignment Alternative 4 6-149
Figure 6-87 : Refined Air Cargo Alternative 3 6-152
Figure 6-88 : Refined GA Development Area Alternative 1 6-153
Figure 6-89 : Refined West Side Aviation Area Alternative 2 6-157
Figure 6-90 : Preferred Support Facility Development and GSE Considerations 6-159
Figure 6-91 : Non-Aviation Use Properties 6-161
Figure 6-92 : Preferred Airport Development Concept 6-165

Chapter 7 – Implementation Plan

Figure 7-1 : Airport Capital Improvement – Phase One 7-11
Figure 7-2 : Airport Capital Improvement – Phase Two 7-17
Figure 7-3 : Airport Capital Improvement – Phase Three 7-22
Figure 7-4 : Airport Capital Improvement – Phase Four 7-26
Figure 7-5 : Phasing Plan 7-28

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019

AIRPORT MASTER PLAN UPDATE

CHAPTER 1: INTRODUCTION

McFarland Johnson

Table of Contents

1. Introduction 1-1
1.1. Airport Background 1-1
1.1.1. Airport History 1-1
1.1.2. Airport Role 1-1
1.1.3. Greenville-Spartanburg Airport Commission 1-2
1.1.4. Airport Strategy 1-2
1.2. Keys to a Successful Master Plan 1-3
1.2.1. Master Plan Goals and Objectives 1-3
1.3. Review of Existing Studies 1-5
1.3.1. Previous Airport Master Plan 1-5
1.3.2. Terminal Area Study and Wingspan 1-5
1.3.3. Landscape Master Plan 1-5
1.3.4. Master Land Use and Commercial Development Study 1-6
1.3.5. I-85 Corridor Analysis and Widening Project 1-6
1.4. Conclusion 1-6

1. Introduction

As the owner, sponsor and operator of the Greenville-Spartanburg International Airport (GSP or Airport), it is the desire of the Greenville-Spartanburg Airport District (District), to evaluate the airport through preparation of an airport master plan, to assure that the airport and its environs are safe and efficient, and to evaluate the growing needs of the airport users and the aviation needs of surrounding communities. This report documents the findings, conclusions and recommendations developed in the 2017 Master Plan for GSP and is intended to support future decision making of the District.

This introduction provides general background information about the Greenville-Spartanburg International Airport, summarizes broad goals and objectives of the master plan, provides a concise review of previous prepared studies which have bearing on this master plan, and describes the organization of the technical document.

1.1. AIRPORT BACKGROUND

1.1.1. Airport History

GSP opened on October 15, 1962, replacing Greenville Downtown Airport and Spartanburg Downtown Airport as the primary airline destination in the region and becoming the first non-military airport in the country to be equipped with a runway centerline lighting system. Throughout the 1970s and 80s, GSP expanded its presence in the national airspace system and developed its air carrier terminal and cargo facilities. The runway was lengthened twice in the 1990s to its present length of 11,001 feet. To honor the tireless work to establish the airport and his decades of service to GSP, the airfield was named for Mr. Roger Milliken in 2004 – Greenville Spartanburg International Airport – Roger Milliken Field.

Because of GSP's proximity to large hub airports in nearby Atlanta and Charlotte, the Airport has struggled in the past to attract and retain a variety of air carriers and city pair options. Over the last decade, however, more demand for air services from GSP have been realized and addressed. Allegiant Air began flights to Florida in 2006, and in 2011 Southwest Airlines began service to five cities. In 2011 GSP received an ANNIE Award from Airline and Airport News & Analysis for being the fastest-growing small airport in the United States. In 2012, the Airport contributed over $817 million to the upstate economy. This number grew to $947 million in 2017 according to South Carolina Aeronautics Commission's 2018 Economic Impact Technical Report. Today, the five airlines serving GSP, providing direct flights to 14 destinations, and the regular scheduled cargo services continue to advance the economic prosperity of the region by providing a safe, convenient, user-friendly and cost competitive air transportation system connecting the region with the nation and world.

1.1.2. Airport Role

Greenville-Spartanburg International Airport is designated by the FAA as a publicly owned, public-use facility. Under the Airport and Airways Improvement Act, the Secretary of Transportation is

required to publish a national plan for the development of public-use airports. This plan is published as the National Plan of Integrated Airport Systems (NPIAS) and includes all commercial service, reliever (high capacity general aviation airports in metropolitan areas), and select general aviation airports.

The most recent NPIAS (2017-2021) identifies GSP as one of 382 Primary commercial service airports in the United States, and further classifies the Airport as one of 72 Small Hub facilities in the national airspace system indicating the Airport receives between 0.05 to 0.25 percent of the annual U.S. commercial enplanements. Based on a review of anticipated airport capital improvement projects eligible for federal funding participation, the NPIAS report identifies over $35 million in development cost for GSP through 2021.

The South Carolina Aviation System Plan (SCASP) identifies GSP as one of six commercial service airports in the state enplaning over 1 million passengers and over 21 million pounds of cargo in 2016.

1.1.3. Greenville-Spartanburg Airport Commission

The Greenville-Spartanburg Airport Commission is the governance body of the Greenville-Spartanburg Airport District which owns and operates the Greenville-Spartanburg International Airport. The Commission is comprised of six members who are appointed by the Governor of South Carolina and includes three members residing in Spartanburg County and three from Greenville County, all requiring majority recommendation from their respective county's legislative delegation. Members of the Commission serve for a term of six years and no term limits exist.

1.1.4. Airport Strategy

The GSP Strategic Business Plan 2014-2020 outlines the District's current key management framework and maps out a specific set of strategies that serve to guide the District in successfully delivering core aviation services necessary for the region's economic growth and prosperity. The GSP strategic business plan is updated regularly to ensure a flexible and resilient process over time, focused on a cycle of continuous self-assessment and course correction.

Mission and Vision

Since GSP was built over a half-century ago, the Airport has benefited from consistent leadership and commitment to the foundations provided by the Airport's mission and visions statements, as outlined below:

Airport Mission:	To advance the economic prosperity of the region by providing a safe, convenient, user-friendly and cost-competitive air transportation system connecting the region with the nation and world.
Airport Vision:	Serve as the region's global transportation hub and economic catalyst by providing best-in-class infrastructure and service.

1.2. KEYS TO A SUCCESSFUL MASTER PLAN

An airport master plan study is needed to address key issues, objectives and goals pertinent to the airport's development over a 20-year planning period. The FAA recommends an airport update its master plan every seven to ten years. GSP's previous master plan was completed in 2003. The Greenville-Spartanburg Airport Master Plan Update (Study) was initiated in early 2017. The Study analyzes existing and future operations at the airport to determine future development needs.

The Study provides new forecasts of aviation demand, identifies physical improvements required to accommodate future demand, and promotes land use recommendations necessary to protect the airport and its environs. Additionally, a capital improvement plan, pavement management plan, Airport GIS (AGIS) Survey and revised Airport Layout Plan (ALP) drawing set will be produced as final deliverables for the Study.

1.2.1. Master Plan Goals and Objectives

The overarching goal of this study is to determine how GSP can best position itself to continue to provide for safe, reliable and efficient aeronautical operations, accommodate growing and changing aeronautical demands, and ensure regional economic success. To simplify and clarify this broad goal several specific goals and objectives were identified for this study. These include:

Goal #1 – Provide an airport that is safe and reliable

Objectives:

- Protect FAA mandated safety areas and object free areas.
- Ensure that facilities meet the demands of the most demanding aircraft making regular use of the facilities.
- Minimize obstructions to air navigation.

Goal #2 – Maintain or enhance the efficient operation of the Airport.

Objectives:

- Plan airfield and airport facilities that accommodate aircraft operational demand and aircraft fleet mix within and beyond the planning horizon.
- Plan airport facilities that accommodate passenger demand within and beyond the planning horizon.
- Promote opportunities to capitalize on new infrastructure and future growth areas.

Goal #3 – Provide a long-term development plan which minimizes negative environmental impacts.

Objectives:

- Identify the major environmental issues of concern.
- Minimize potential environmental impacts through responsible development planning.
- Provide a facility that minimizes adverse effects on intangible environmental concerns.
- Consider the noise sensitivity of nearby neighborhoods and seek to minimize noise impacts.

Goal #4 – Enhance the long-term fiscal sustainability of the Airport.

Objectives:

- Maximize the business effectiveness of the Airport.
- Consider the Airport's role as a local and regional economic asset.
- Identify and seek to expand upon synergies with Greenville and Spartanburg Counties and the City of Greer.
- Consider the Airport's relationship to major industry in the region.

Goal #5 – Develop the airport to support local and regional economic goals while accommodating new opportunities or shifts in development patterns.

Objectives:

- Develop an airport layout plan that easily integrates with existing and proposed transportation infrastructure.
- Provide a highly graphical, easily understood master plan and airport layout plan set to enable the District to clearly communicate the Airport's development initiatives with funding partners and stakeholders.
- Pre-position the Airport to benefit from a broad range of funding sources including state and federal agencies.

Goal #6 – Engage Airport stakeholders in the visioning and planning process and communicate externally.

Objectives:

- Establish and meet regularly with stakeholder groups as part of the planning process.
- Provide a forum for stakeholders to discuss future planning needs of the Airport.
- Integrate the contributions of the stakeholders into the master plan and airport layout plan.
- Provide information to the public through a variety of mediums including social media and website development.

Goal #7 – Facilitate long-term Airport development strategies through thoughtful land use planning.

Objectives:

- Validate the highest and best use of airport properties.
- Prescribe a long-range airport land use plan.
- Depict a long-range airport development plan through the airport layout plan.

1.3. REVIEW OF EXISTING STUDIES

To support the effort of updating the Greenville-Spartanburg Airport Master Plan and ALP drawings, several previously developed studies and reports pertaining to the Airport and its surroundings were referenced. These following sections identify and discuss the most substantive elements of these studies.

1.3.1. Previous Airport Master Plan

The 2003 Airport Master Plan Update represents the most significant Airport specific planning study for GSP in recent years. Over the last 15 years many of the recommendations made from this plan have been implemented, including the rehabilitation of Runway 4-22 and renovation of the terminal building and passenger apron area. The concept of a second parallel runway and expansion of industrial aviation developments identified in the 2003 Master Plan will be reevaluated as part of this study.

1.3.2. Terminal Area Study and Wingspan

In 2010 GSP prepared a terminal area study to update requirements for the GSP terminal based on up-to-date enplanement models, new requirements and technologies, and anticipated developments in the aviation industry. This study resulted in a conceptualized program which would eventually become GSP's terminal improvement project named Wingspan. The overall goal of the $127 million Wingspan project was to increase capacity, improve efficiency, incorporate safety processes, integrate sustainable practices, and positively impact the economic landscape. Wingspan was accomplished in 60 months. Over that time, the Airport rebuilt the central core area of the terminal, remodeled the baggage claim and gate concourse areas, increased concession availability and restructured the security check-in. The terminal opening celebration was held in May of 2017, though some terminal apron work is still on-going.

1.3.3. Landscape Master Plan

In 2016 GSP engaged in a comprehensive landscape management and master planning effort focused on creating and maintaining a unique and high-quality landscape across the Airport campus and providing Airport staff with data and direction to make informed landscape management and aesthetically-focused decisions. Through the process of this planning initiative GSP thoughtfully reviewed the existing airport landscape environment, developed improvements for individual landscape elements, and established standards and guidelines for successful implementation and maintenance of their landscape development objectives, including:

- Improvements to the terminal landscape
- Improve safety and health of the GSP campus
- Enrich the arrival experience
- Extend the GSP brand
- Promote GSP's commitment to the landscape

1.3.4. Master Land Use and Commercial Development Study

In 2013 GSP prepared a comprehensive campus-wide land use plan with site development concepts for specific areas on and/or adjacent to the Airport. The goal of this effort was to create a unified framework for future development, generate a strategic land development approach and provide the District with the knowledge and tools necessary to make informed land management and growth management decisions. This was accomplished across a three-volume report which independently focus on the following elements:

- Market & Highest Best Use Analysis
- Land Use Planning & Development
- Implementation Plan & Financial Analysis

Greenville-Spartanburg's Master Land Use and Commercial Development Study illustrated a variety of opportunities for the District to provide both aviation-use and aviation compatible non-aviation use properties on-campus and prescribed a number of strategic initiatives to begin to encourage such development and realize its benefits.

1.3.5. I-85 Corridor Analysis and Widening Project

In 2012 the South Carolina Department of Transportation (SCDOT) identified congestion problems throughout multiple interstate highways, including segments within Interstate 85 (I-85). As a critical transportation route between Greenville and Spartanburg as well as Charlotte and Atlanta, a corridor analysis was conducted and a highway widening initiative was developed thereafter. The I-85 Corridor Study focused on 22 miles of the highway from the White Horse Road (US 25) to Fort Prince Boulevard (SC 129) connections to identify solutions for current and future capacity needs. Alternatives range from travel demand management techniques to operational and capacity-based initiatives. Since the completion of the Study, SCDOT has initiated several improvement projects to respond to the capacity needs of I-85 and continues to monitor opportunities for improvement along the corridor.

Across the course of this master plan's planning horizon (2040), several I-85 improvements are likely to occur around airport property, specifically between the I-85 and Route 101 interchange to the east and the I-85 and Route 14 interchange to the west. Specifically, the I-85 and Aviation Parkway interchange is anticipated to be improved with a new northbound on-ramp in the future to improve traffic flow.

1.4. CONCLUSION

The following chapters will provide a detailed review of existing airport conditions and activity levels, forecast 20-years of operational activity while considering multiple plausible scenarios, determine future facility requirement needs, score and rank alternative development considerations, and provide a multi-year capital improvement program indented to support executive level decision making. Additionally, this plan will inform the development of an Airport Layout Plan (ALP) drawing set used to communicate the Airport's regulatory compliance and outline its future development initiatives to the Federal Aviation Administration and SCDOT.

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019

AIRPORT MASTER PLAN UPDATE

CHAPTER 2: INVENTORY

McFarland Johnson

Table of Contents

2. Inventory 2-1
2.1. Airport Location 2-1
2.1.1. Airport Service Area 2-1
2.1.2. Meteorological Conditions and Climate 2-6
2.2. Airfield Facilities 2-10
2.2.1. Runways 2-10
2.2.2. Taxiways and Taxilanes 2-13
2.2.3. Apron Areas 2-15
2.2.4. Pavement Management 2-16
2.2.5. Instrumentation, Visual and Navigational Aids 2-16
2.3. Airspace Procedures and Air Traffic Control 2-26
2.3.1. Air Traffic Control Facilities 2-29
2.4. Landside Facilities 2-30
2.4.1. Passenger Terminal Facilities 2-30
2.4.2. General Aviation Facilities 2-49
2.4.3. Cargo Facilities 2-50
2.4.4. Airport Support Facilities 2-51
2.4.5. Utility Infrastructure 2-53
2.4.6. Regional Access, Airport Parking and Ground Transportation 2-57
2.5. Airport Tenants 2-64
2.5.1. Cerulean Aviation 2-64
2.5.2. Federal Aviation Administration 2-66
2.5.3. National Weather Service – National Oceanic and Atmospheric Administration (NOAA) 2-66
2.5.4. Cargo and Freight 2-66
2.5.5. Industrial Park Road Complex 2-67
2.6. Airport Land Use Patterns 2-68
2.6.1. Airport Area Land Use 2-68
2.6.2. Airport Area Zoning 2-68
2.6.3. Airport Master Land Use and Development Plan 2-71
2.7. Airport Community Surveys 2-73
2.8. Conclusion 2-74

List of Tables

Table 2-1 : Commercial Service Airports Near GSP 2-4
Table 2-2 : General Aviation Airports Near GSP 2-6
Table 2-3 : Wind Data for Runway 4-22 2-7
Table 2-4 : Wind Coverage by Runway End 2-7
Table 2-5 : GSP Instrument Procedures Approach Minima 2-17
Table 2-6 : Commercial Terminal Airline Space Allocation 2-43
Table 2-7 : Commercial Terminal Concessionaire Space 2-45
Table 2-8 : Commercial Terminal Public Areas 2-47
Table 2-9 : Commercial Terminal Non-Public Areas 2-47
Table 2-10 : GA Hangars 2-50
Table 2-11 : Airport Parking Summary 2-64
Table 2-12 : Airport Master Land Use and Development Plan Tracts 2-72

List of Figures

Figure 2-1 : Airport Location Map 2-2
Figure 2-2 : Airport Vicinity Map 2-3
Figure 2-3 : Airport Service Area Drive Time Map 2-5
Figure 2-4 : All Weather Wind Rose 2-8
Figure 2-5 : IFR Wind Rose 2-9
Figure 2-6 : Airfield Facilities 2-11
Figure 2-7 : Runway 22 ILS or LOC 2-18
Figure 2-8 : Runway 4 ILS or LOC/DME 2-19
Figure 2-9 : Runway 4 ILS 2-20
Figure 2-10 : Runway 4 (CAT II and III) 2-21
Figure 2-11 : Runway 4 RNAV (GPS) 2-23
Figure 2-12 : Runway 22 RNAV (GPS) 2-24
Figure 2-13 : Generalized Airspace Schematic 2-27
Figure 2-14 : GSP Airspace 2-28
Figure 2-15 : Landside Facilities 2-33
Figure 2-16 : Commercial Terminal 1st Floor ("Ticketing Level") 2-37
Figure 2-17 : Commercial Terminal 2nd Floor ("Apron Level") 2-39
Figure 2-18 : Commercial Terminal 3rd Floor ("Concourse Level") 2-41
Figure 2-19 : Concourse and Gate Diagram 2-48
Figure 2-20 : Infrastructure and Utilities 2-55
Figure 2-21 : Airport Access, Ground Transportation and Parking Facilities 2-59
Figure 2-22 : Industrial Park Road Buildings 2-67
Figure 2-23 : Land Use Map 2-69
Figure 2-24 : Zoning Map 2-70
Figure 2-25 : Airport Master Land Use and Development Plan Tracts 2-73

2. Inventory

The development of a master plan update for the Greenville-Spartanburg International Airport (GSP or Airport) requires the collection and evaluation of baseline information relating to the Airport's property, facilities, services, and tenants, as well as Airport access, utilities and information on its immediate environs. The information presented herein will be referenced in subsequent sections of the master plan when developing aviation activity forecast, exploring demand/capacity relationships, and analyzing future facility requirements. The information covered in this chapter was obtained through a variety of sources including: site visits, interviews with Airport staff, tenants and users, and through detailed review of Airport records, prior planning initiatives, and public documents. The inventory information presented in this chapter is organized as follows:

- Airport Location
- Airfield Facilities
- Airspace Procedures and Air Traffic Control
- Landside Facilities
- Airport Tenants
- Airport Land Use Patterns
- Airport Community Surveys

2.1. AIRPORT LOCATION

GSP is located approximately three miles south of the City of Greer, SC, 10 miles east of the City of Greenville, SC and 15 miles west of the City of Spartanburg, SC. The Airport resides in both Greenville and Spartanburg Counties, which are located in the northwest corner of the State, also known as South Carolina's upstate region. The Airport covers approximately 3,600 acres and major cities near GSP include Columbia, SC (79 miles southeast via automobile); Charlotte, NC (93 miles northeast via automobile); and Atlanta, Georgia (156 miles southwest via automobile). **Figure 2-1** and **Figure 2-2** provide an airport location and vicinity map, respectively.

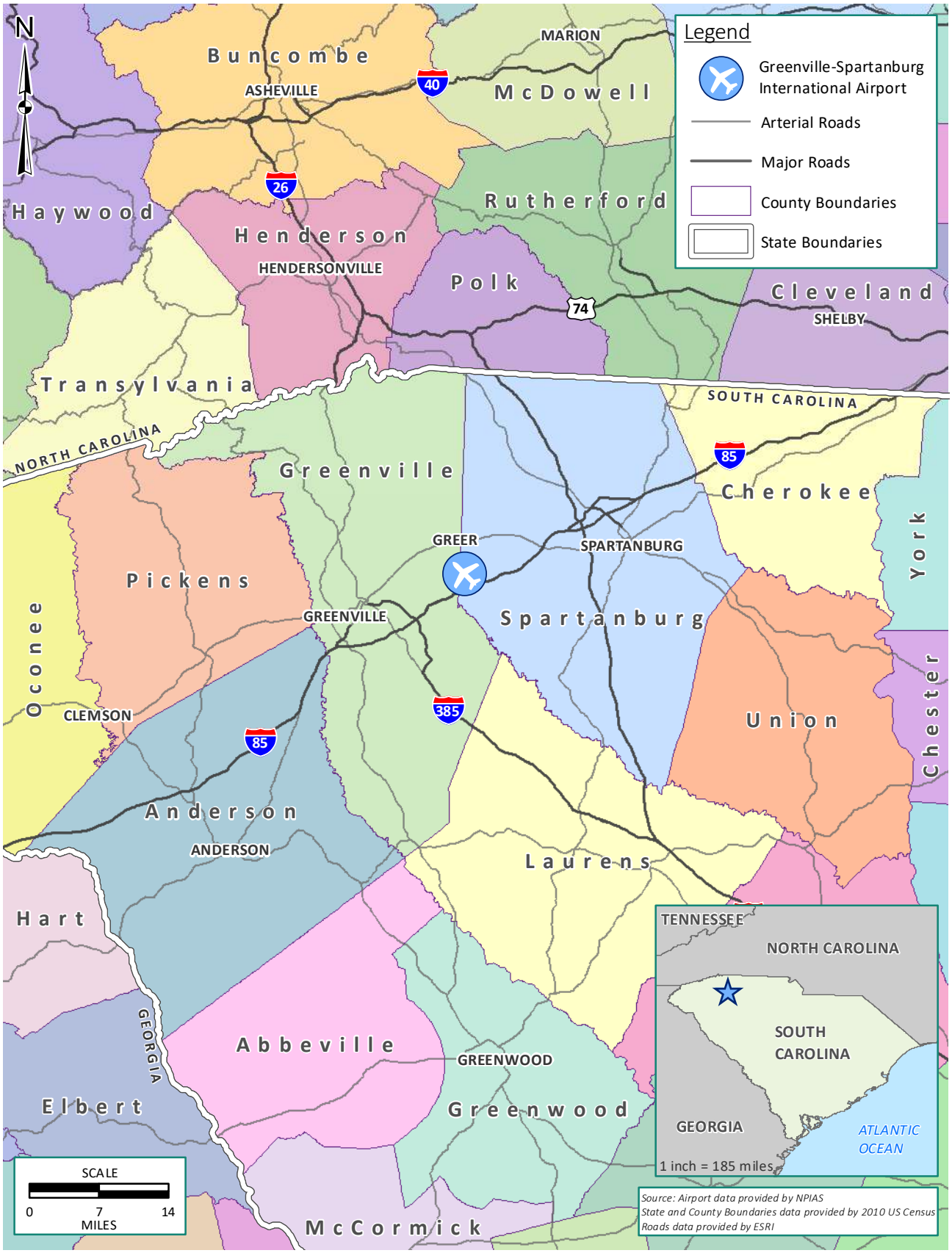
2.1.1. Airport Service Area

An airport's user base is often most strongly influenced by the connectivity of the airport to surrounding communities. The airport service area is an area where there is a potential market for airport services. Access to general aviation (GA) airports, commercial air service, and transportation networks all have bearing on the size and limits of the airport service area, as well the quality of aviation facilities, distance and other subjective criteria.

For the purpose of this study, the airport service area is based on vicinities within a 30- and 60-minute drive time to GSP.

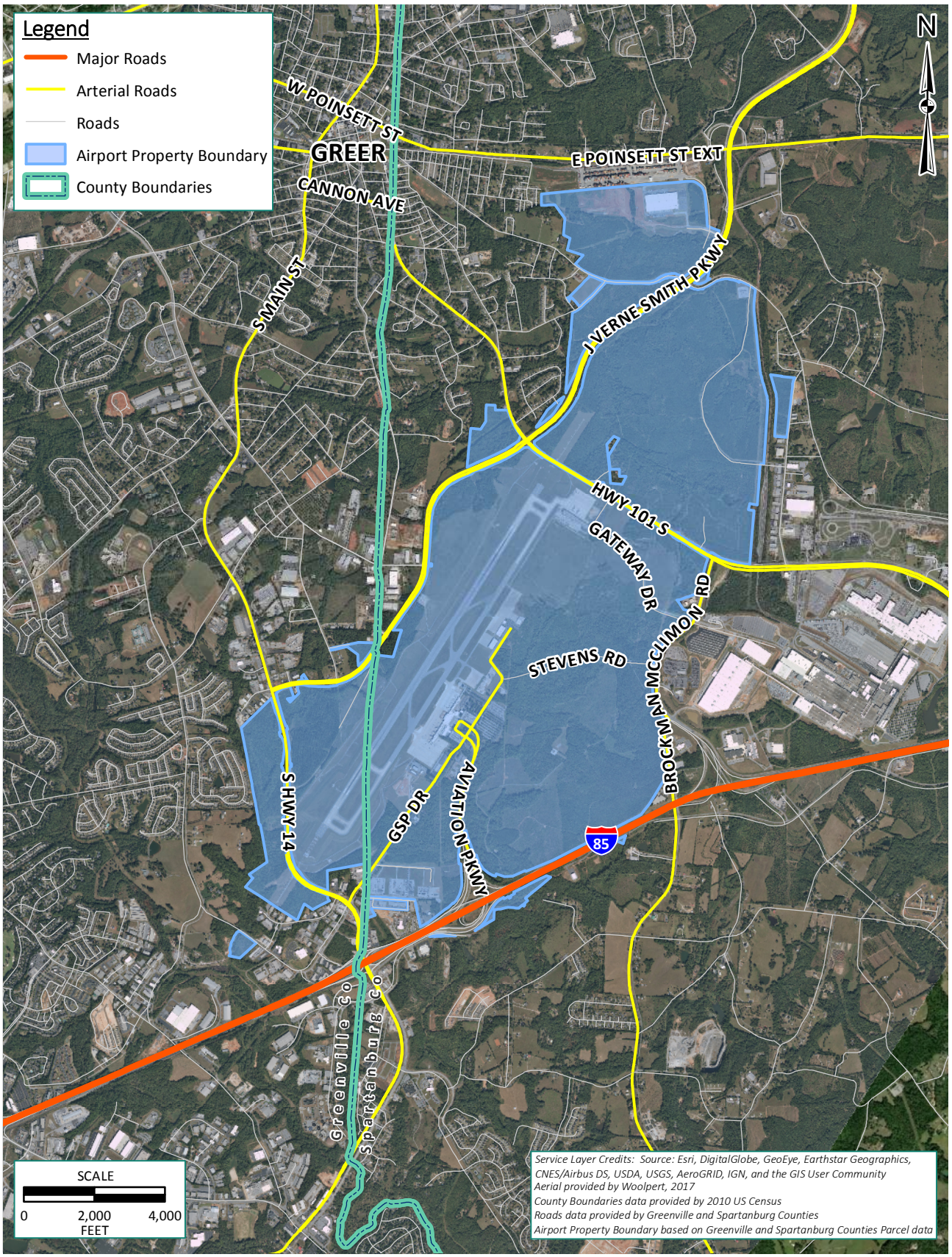
- 30 minutes or less: Greenville, SC, Spartanburg, SC
- 60 minutes or less: Clemson, SC, Anderson, SC, Hendersonville, NC

Figure 2-1: Airport Location Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\2-1 Location.mxd

Figure 2-2: Airport Vicinity Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\2-2 Vicinity.mxd

The Airport is the only commercial airport within a 60-minute drive time radius. Other commercial airports, such as Columbia Metropolitan Airport, Charlotte Douglas International Airport, Asheville Regional Airport and Concord Regional Airport are over an hour away. The only airports that fall within a 60-minute drive time are classified as private and public reliever airports. A reliever airport is a type of general aviation airport that relieves the congestion of commercial service airports and provides an alternative for landing corporate and general aviation aircraft. **Figure 2-3** depicts GSP's airport service area drive time map.

Commercial Service Airports in Vicinity

Although none fall within the defined airport service area, other commercial service airports in the region include locations in North and South Carolina as shown in **Table 2-1**.

Table 2-1: Commercial Service Airports Near GSP

Name	Runways	FY 2015 Based Aircraft	FY 2015 Annual Operations	FY 2015 Enplanements	Drive Time from GSP (Mins.)
Asheville Regional (AVL)	17/35: 7,001 x 100	132	62,878	396,218	61-90
Charlotte/Douglas Int. (CLT)	18C/36C: 10,000 x 150; 18R/36L: 9,000 x 150; 18L/36R: 8,677 x 150; 5/23: 7,502 x 150	72	545,602	21,766,399	61-90
Hartsfield – Jackson Atlanta Int. Airport (ATL)	9L/27R: 12,390 x 150; 8R/26L: 9,999 x 150; 8L/26R: 9,000 x 150; 10/28: 9,000 x 150	3	882,497	44,141,814	150+

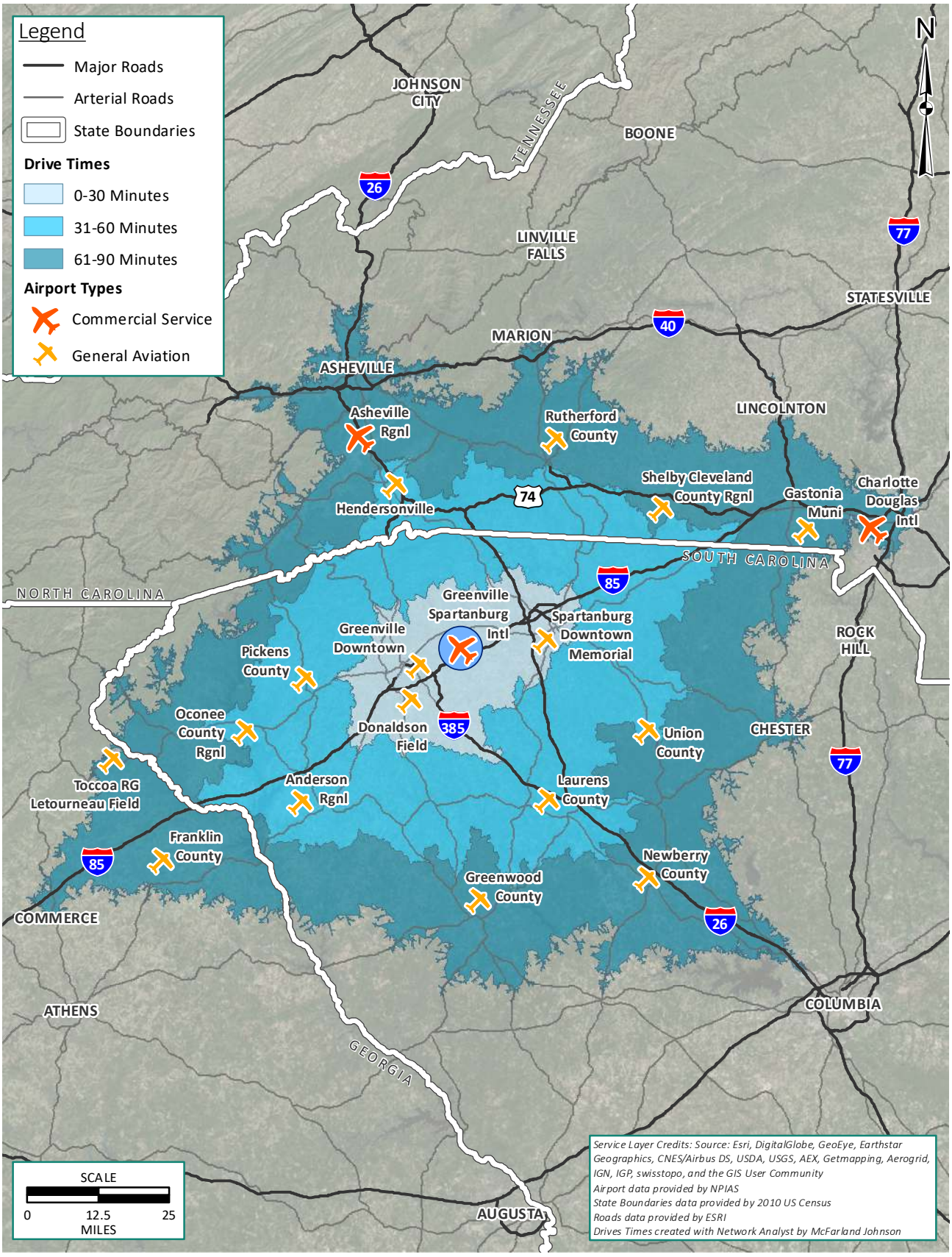
Notes: FY = Fiscal Year, Int.= International

Source: FAA Form 5010, Airport Master Record and 2017 FAA Terminal Area Forecast

General Aviation Airports in Vicinity

Several GA airports are located within a 60-minute drive of GSP and are shown in **Figure 2-3** with additional general aviation airports also listed in **Table 2-2**.

Figure 2-3: Airport Service Area Drive Time Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\2-3 DriveTime.mxd

Table 2-2: General Aviation Airports Near GSP

Name	Runways	FY 2015 Based Aircraft	FY 2015 Annual Operations	Distance (NM)
Anderson Regional	5/23: 6,002' x 149'; 17/35: 4,996' x 149'	73	29,800	34
Donaldson Field	5/23: 8,000' x 150'	45	28,091	11
Franklin County	08/26: 5,000' x 75'	22	6,000	56
Gastonia Municipal	03/21: 3,770' x 100'	27	9,910	55
Greenville Downtown	11/29: 5,393' x 100'; 10/28: 4,000' x 80'	164	49,616	7
Greenwood County	9/27: 5,001' x 100'; 5/23: 3,600' x 60'	56	40,000	39
Hendersonville	15/33: 3,075 x 40'	45	24,550	26
Laurens County	8/26: 4,051' x 75'	18	5,500	27
Newberry County	4/22: 4,001' x 75'	11	12,100	45
Oconee County Regional	7/25: 5,000' x 100'	63	36,000	35
Pickens County	5/23: 5,002' x 100'	37	23,177	24
Rutherford County/Marchman Field	1/19: 5,000' x 100'	38	33,500	34
Shelby-Cleveland County Regional	5/23: 5,001' x 100'	38	18,200	36
Spartanburg Downtown Memorial	5/23: 5,202' x 10'0'	120	53,000	13
Toccoa RG Letourneau Field	03/21: 5,008' x 100'	52	20,000	56
Union County, Troy Shelton Field	5/23: 3,508 X 60	9	6,500	31

Notes: FY = Fiscal Year, Int.= International, NM = Nautical Miles

Source: FAA Form 5010, Airport Master Record and 2017 FAA Terminal Area Forecast

2.1.2. Meteorological Conditions and Climate

The Greenville-Spartanburg area, like much of the Piedmont region of the southeastern United States, has a humid subtropical climate with four distinct seasons; the region is part of USDA Hardiness zone 7b/8a. The area enjoys hot summers and no dry season with temperatures varying from 31°F to 89°F over the course of the year, and is rarely below 22°F or above 96°F. The hot season is generally experienced from late May through mid-September, while the cool season typically occurs from late November through late February.

Precipitation is distributed relatively evenly throughout the year with higher than average rain chances in the late summer months, and amounts of approximately 50 inches annually. The number of days with any measurable precipitation is 77 and there are 220 sunny days per year. Monthly rainfall is between 3.1 and 4.2 inches with an average of three inches of snow during the winter. Cloud cover is most prevalent in the winter months.

Wind Coverage

Runway wind coverage at an airport refers to the percentage of time that crosswinds are within an acceptable velocity. Per the FAA Advisor Circular (AC) 150/5300-13A, *Airport Design*, the minimum wind coverage permitted on a runway, considering all observations, is 95 percent. The wind coverage is analyzed based on the maximum crosswind component of the critical aircraft for

a specific runway under all weather conditions. The Airport's wind data combined with the Runway configuration yielded the wind coverage results that are contained in **Table 2-3**. A breakdown of wind coverage by runway end is also provided in **Table 2-4**.

Table 2-3: Wind Data for Runway 4-22

Condition	Wind Coverage by Crosswind Speed				Number of Observations	Percentage of Ops
	10.5kts	13kts	16kts	20kts		
All-Weather	98.15%	99.18%	99.78%	99.95%	133,566	100%
Instrument Flight Rules (IFR)	98.55%	99.29%	99.78%	99.93%	20,245	15.16%
Visual Flight Rules (VFR)	98.08%	99.16%	99.78%	99.96%	101,329	75.86%
Poor Visibility Conditions (PVC)	99.43%	99.67%	99.79%	99.88%	11,992	8.98%

Source: ASOS 723120 10-year Wind History of Hourly Observations 2017-2016 as provided by National Climatic Data Center, September 2017; McFarland Johnson, 2017

Table 2-4: Wind Coverage by Runway End

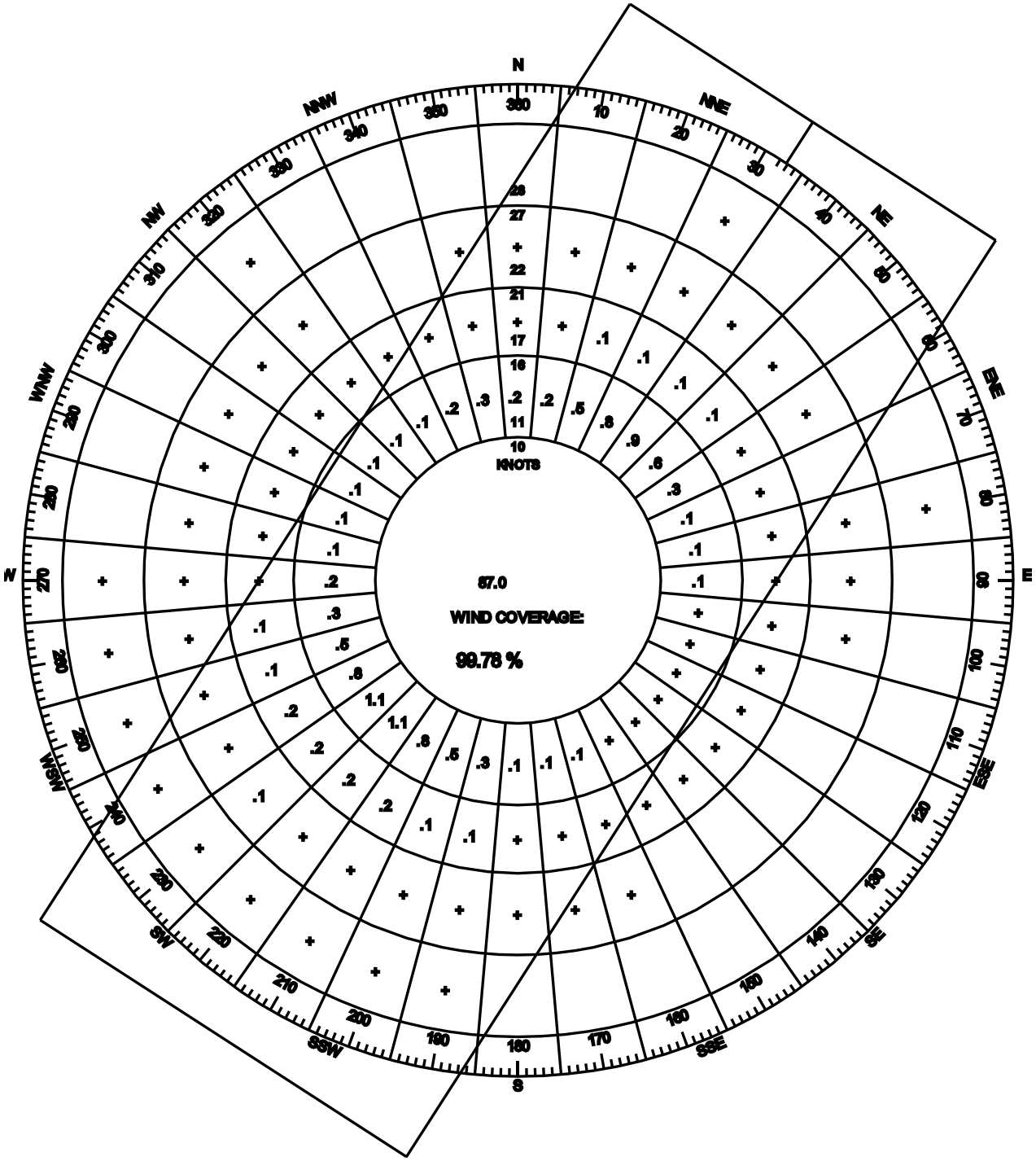
Condition	Runway	Wind Coverage by Crosswind Speed			
		10.5kts	13kts	16kts	20kts
All Weather	4	58.42%	58.84%	59.08%	59.13%
	22	61.47%	62.35%	62.71%	62.84%
IFR	4	57.57%	58.02%	58.27%	58.32%
	22	63.04%	63.67%	64.04%	64.16%
VFR	4	65.13%	65.36%	65.54%	65.59%
	22	49.39%	49.89%	50.20%	50.31%
PVC	4	63.80%	63.83%	63.87%	63.87%
	22	70.75%	70.96%	71.05%	71.13%

Source: ASOS 723120 10-year Wind History of Hourly Observations 2017-2016 as provided by National Climatic Data Center, September 2017; McFarland Johnson, 2017

During times weather conditions are especially poor aircrew and aircraft with special certification are more likely to execute an approach to Runway 4 at GSP as CAT II and CAT III ILS approaches are available to that runway end. CAT II and CAT III ILS approaches allow for more precise landing and roll-out control than provided by the traditional CAT I ILS available to both the Runway 4 and Runway 22 end at GSP. Such sophisticated approaches are enabled by the Runway 4 approach lighting system with centerline sequenced flashing lights (ALSF-2), in-pavement touchdown zone lighting at the Runway 4 end, and the in-pavement runway centerline lighting system.

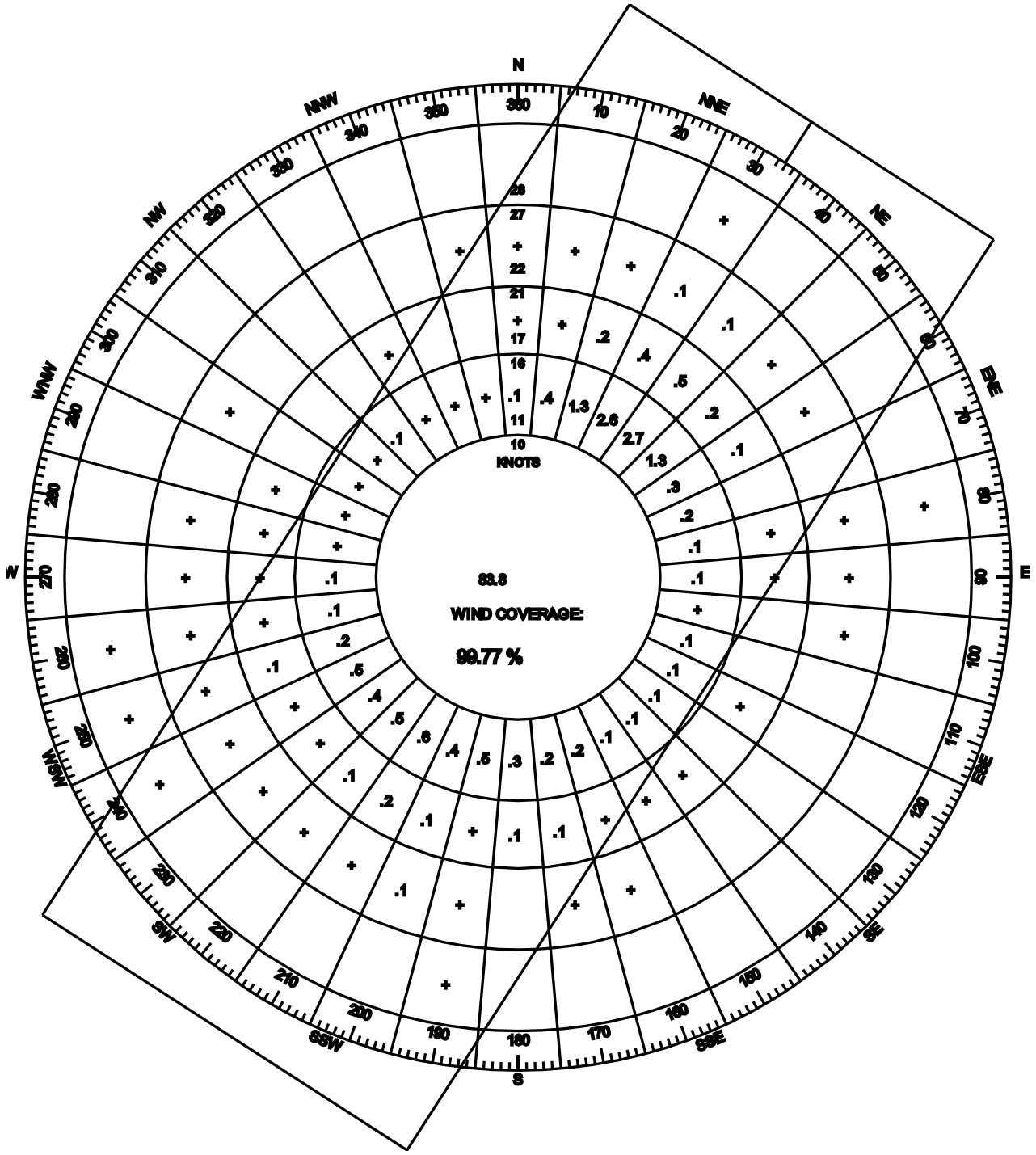
Figure 2-4 and **Figure 2-5** depict the calculated wind roses for the all-weather and instrument flight rules (IFR) conditions, respectively.

Figure 2-4: All Weather Wind Rose



Source: National Climatic Data Center, September 2017

Figure 2-5: IFR Wind Rose



Source: National Climatic Data Center, September 2017

2.2. AIRFIELD FACILITIES

Discussion of airport facilities in this report will be divided into airside and landside sections. Airside facilities are associated with the taxiing, takeoff, and landing of aircraft (i.e., the airfield and its components) and are discussed under the following headings:

- Runways
- Taxiways and Taxilanes
- Apron Areas
- Pavement Management
- Instrumentation, Visual and Navigational Aids

Figure 2-6 depicts existing airfield infrastructure and facilities.

2.2.1. Runways

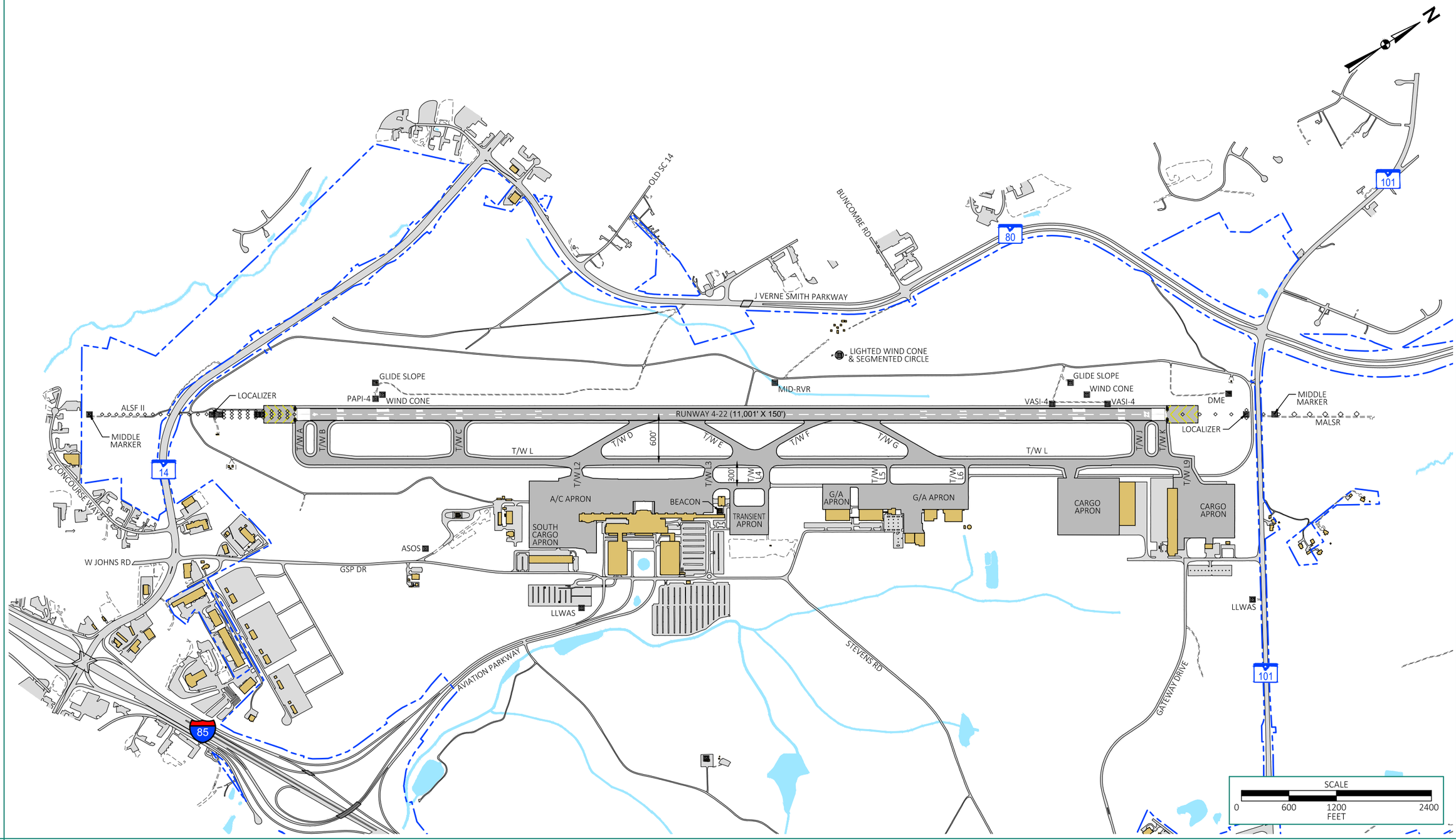
GSP has a single, bi-directional, asphalt-concrete runway. Runway 4-22 meets the criteria for FAA Airport Reference Code (ARC) D-V. An ARC is composed of the Airplane Design Group (ADG), which is the classification of aircraft based on wingspan and tail height, and the Aircraft Approach Speed (AAC). With a D-V classification, Runway 4-22 can accommodate aircraft with wingspans up to but not including 214 feet, a tail height up to but not including 66 feet, and approach speeds up to but not including 166 knots. Based on information obtained from GSP tower personnel Runway 4 supports 45 percent of airfield operations, while Runway 22 supports the remaining 55 percent. Not only do typical wind patterns support the utilization of Runway 4 more than Runway 22, Runway 4 is the preferred runway during calm wind conditions.

Runway 4-22

Runway 4-22 has a northeast to southwest orientation and measures 11,001 feet in length and 150 feet wide with 35-foot paved shoulders on either side. The Runway 4 end elevation is 941 feet and the Runway 22 end elevation is 963.7 feet to yield a 0.2 percent gradient across the Runway's length. Each end of the Runway is supplemented with 220-foot wide and 400-foot long paved blast pads.

Runway 4-22 is equipped with high intensity runway edge lighting (HIRL) and has in-pavement centerline lights spaced at 50-foot intervals. These lights are white except for the last 3,000 feet of each runway end, where they alternate white and red for the next 1,969 feet and are consistently red for the last 984 feet. Runway 4 is equipped with a 2,400-foot high intensity ALSF-2 and Runway 22 is equipped with a 1,400-foot medium intensity approach lighting system with runway alignment indicator lights (MALSR). The Runway 4 ALSF-2 is available between 0600 and 2345 local time (UTC-5) each day, and operates as a MALSR system during the off hours. For additional visual guidance, both Runway 4 and Runway 22 are equipped with a four-light precision approach path indicators (PAPI) with a standard three-degree glide paths. Both PAPIs are located on the west side of Runway 4-22. Both runways are marked with precision runway markings and the markings are in good condition.

Figure 2-6: Airfield Facilities



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\EXISTING.dwg

Page intentionally left blank.

Runway 4 has a Category IIIb precision instrument landing system (ILS) with distance measuring equipment (DME) and Runway 22 is equipped with Category I precision ILS. Additionally, Runway 4-22 is equipped with a forward scatter runway visual range (RVR) system to inform pilots of the exact visibility conditions on the airfield. Utilizing this system, the CAT IIIb ILS approach to Runway 4 permits aircraft to approach GSP in very poor visibility conditions.

To maintain safe and efficient operations at an airport, the FAA requires that certain areas on and near the airport are clear of objects or restricted to objects with a certain function, composition, and/or height as defined in FAA AC 150/5300-13A, *Airport Design*. To comply with these requirements, Runway 4-22 has a standard Runway Safety Area (RSA) width of 500 feet with a length of 1,000 feet beyond the departure ends and a Runway Object Free Area (ROFA) width of 800 feet with a length of 1,000 feet beyond the departure ends. The Runway Object Free Zone (ROFZ) width is 400 feet and extends 200 feet beyond each runway end. All protection areas are standard for Runway 4-22.

2.2.2. Taxiways and Taxilanes

GSP has one full length parallel taxiway with nine connecting taxiways to Runway 4-22, four of which are directionally specific and permit rapid exits from the Runway, and six taxiways providing access to apron areas. The taxiway system includes standard yellow pavement markings and enhanced centerline markings prior to hold short markings leading to runway intersections. The taxiway system is equipped with high intensity taxiway lighting (HITL) across its entirety. Taxiways serving large commercial or cargo aircraft have a Taxiway Safety Area (TSA) width of 214 feet and Taxiway Object Free Area (TOFA) width of 320 feet to satisfy ADG V standards. Taxiways intended for smaller aircraft (Taxiways L5 and L6) have a TSA width of 79 feet and a TOFA of 131 feet to satisfy ADG II requirements.

Taxiway L

Taxiway L is a full-length parallel taxiway that serves as the airfield's main taxiway. Taxiway L is on the east side of Runway 4-22 and maintains a centerline to centerline separation of 600 feet from the runway for its entire length. The taxiway maintains a width of 75 feet along its entire length and is equipped with 35-foot-wide paved shoulders on each side. On the west side of Taxiway L are Taxiways A through K (excluding H and I), each providing access to Runway 4-22. To the east of Taxiway L are Taxiways L2 through L9 (excluding L7 and L8) providing access to the various apron areas available at GSP.

Taxiway A

Taxiway A is the southernmost taxiway servicing Runway 4-22 and provides access to the Runway 4 end from parallel Taxiway L to enable full length use of Runway 4. Taxiway A is 100 feet wide with 35-foot-wide paved shoulders on each side.

Taxiway B

Taxiway B is parallel to and located north of Taxiway A. Centerline to centerline separation between Taxiway B and Taxiway A is 300 feet. Taxiway B is 130 feet wide and equipped with 35-

foot-wide paved shoulders on each side. Taxiway B provides access to Runway 4 approximately 340 feet from the Runway 4 threshold.

Taxiway C

Taxiway C is a mid-field connector taxiway located 2,056 feet from the Runway 4 threshold. Taxiway C is 130 feet wide and equipped with 35-foot-wide paved shoulders on each side.

Taxiway D

Taxiway D is a rapid exit taxiway for aircraft arriving on Runway 22. Located 6,552 feet from the Runway 22 threshold, Taxiway D is 75 feet in width with 30-foot-wide stabilized turf shoulders on either side. Aircraft using Taxiway D can proceed in either direction on Taxiway L or access the commercial apron area by means of Taxiway L2[1].

Taxiway E

Taxiway E is a rapid exit taxiway for aircraft arriving on Runway 4. Located 4,950 feet from the Runway 4 threshold, Taxiway E is 75 feet in width with 30-foot-wide stabilized turf shoulders on either side. Aircraft using Taxiway E can proceed in either direction on Taxiway L.

Taxiway F

Taxiway F is a rapid exit taxiway for aircraft arriving on Runway 22. Located 4,344 feet from the Runway 22 threshold, Taxiway F is 75 feet in width with 30-foot stabilized turf shoulders on each side. Aircraft using Taxiway F can proceed in either direction on Taxiway L.

Taxiway G

Taxiway G is a rapid exit taxiway for aircraft arriving on Runway 4. Located 7,152 feet from the Runway 4 threshold, Taxiway G is 75 feet in width with 30-foot-wide stabilized turf shoulders on each side. Aircraft using Taxiway G can proceed in either direction on Taxiway L to access landside facilities.

Taxiway J

Taxiway J is south of and parallel to Taxiway K. Centerline to centerline separation between Taxiway J and Taxiway K is 300 feet. Taxiway J is 130 feet wide and equipped with 35-foot-wide paved shoulders on each side. Taxiway J provides access to Runway 22 approximately 350 feet from the Runway 22 threshold.

[1] *Heavy aircraft restricted to 90-degree turns or less on asphalt portions of the runway or on Taxiway L,D,E,F,G.*

Taxiway K

Taxiway K is the northernmost taxiway servicing Runway 4-22 and provides access to the Runway 22 end from parallel Taxiway L to enable full length use of Runway 22. Taxiway K is 130 feet wide with 35-foot-wide paved shoulders on each side.

Taxiways L2, L3, L4, L5, L6, and L9

Taxiways L2, L3, L4, L5, L6 and L9 connect Taxiway L to the various apron areas and landside facilities at GSP. These taxiways range in width from 40 feet to over 90 feet based on the type of aircraft each is intended to support. Taxiway L2 and L3 provide access to the commercial terminal apron, L4 provides access to the transit apron area, L5 and L6 to the GA apron areas, and L9 to the north cargo apron area.

2.2.3. Apron Areas

GSP has five independent apron areas categorized in this report based on their specific uses. These aprons include: the commercial terminal/south cargo apron, a transit apron, two general aviation aprons and the north cargo apron. All three aprons are located on the east side of Runway 4-22 and Taxiway L.

Commercial Terminal/South Cargo Apron

The commercial terminal/south cargo apron is constructed of portland cement concrete (PCC) covering an area of approximately 118,000 square yards. An apron rehabilitation project recently replaced portions of pavement adjacent to Gates B1-B4 and Gates A1-A4 and A-6. The remainder of apron pavement is in generally good condition.

The commercial terminal/south cargo apron provides access to air carrier gates and passenger boarding bridges. The apron provides space for 13 air carrier gates connecting users to Concourses A and B and two air carrier hardstands. On the southern portion of this apron, two aircraft hardstand positions are available away from the terminal to support air cargo activity. This area can accommodate one 747-8F or six ADG-III sized aircraft. The Airport's air traffic control tower (ATCT) and Index C aircraft rescue and firefighting (ARFF) building are both located on the far northern portion of this apron.

Transit Apron

The transit apron is constructed of PCC measuring 500 feet long and 350 feet wide, this 19,445 square-yard apron is capable of supporting a wide variety of aircraft weighing less than 60,000 pounds. Presently, the taxilanes providing access to this apron are 50 feet wide and each is accessible from the primary taxilane parallel to Taxiway L. The transit apron sits just north of the commercial terminal apron.

General Aviation Aprons

Two independent but collocated general aviation apron areas exist at GSP north of the commercial terminal apron and the transit apron. The southernmost of these two GA apron areas is

constructed of PCC and provides 10,615 square yards of apron adjacent to a large GA storage hangar. This apron space is connected to the northernmost GA apron via a taxilane parallel to Taxiway L and is associated with one storage hanger. This northernmost GA apron, also constructed of PCC, provides over 53,000 square yards of additional GA apron space. This apron is contiguous with three GA storage hangars, the District owned Fixed Base Operator and GA terminal, and will support two additional bulk hangars presently under construction. Approximately 1,500 square yards of apron is used for the parking of aircraft fuel trucks.

North Cargo Area

The main cargo apron area is northernmost of the five apron areas at the Airport. This apron is constructed of PCC and offers over 50,000 square yards of pavement capable of supporting regular use by some of the heaviest freight aircraft in use today. Presently this apron supports cargo activities from the adjacent 120,000 square-foot cargo sorting facility and 5,000 square-foot cargo operations building, as well as U.S. Customs and Boarder Protection which operates from a building located on the apron's northeast corner. Airport staff has expressed the desire to relocate the U.S. Customs and Boarder Protection (CBP) facility to the GA apron in the future to better service the growing international GA traffic. Adjacent to this facility is the UPS cargo building, completed in 2017, which provide 5,000 square feet of tenant space. The north cargo apron has five hardstand positions, two of which provide direct access to the cargo sorting facility.

2.2.4. Pavement Management

As part of this update to the GSP Airport Master Plan an evaluation of airfield pavement condition was conducted to provide insight into not only the current pavement condition and types of damage present, but also to aid in capital improvement decision making. A full Pavement Management Plan report can be found in Appendix A which details the specific findings of the study.

2.2.5. Instrumentation, Visual and Navigational Aids

Navigational aids (NAVAIDs) are any electronic or visual devices, airborne or on the ground, which provide point-to-point guidance information or position data to aircraft in flight. All local traffic is controlled by the FAA ATCT which is operational between 0600 to 2345 local time. GSP has several electronic and visual NAVAIDs that pilots use to locate, navigate to, and land at the airport. A summary of instrument approach minima is shown in Table 2-5.

Table 2-5: GSP Instrument Procedures Approach Minima

Procedure Name	Minimum Visibility	Minimum Descent Altitude (MSL)
RWY 22 ILS or LOC	ILS All Aircraft Categories: ½ mile, LOC Aircraft Categories A and B: ½ mile LOC Aircraft Categories C and D: 5/8 mile	ILS: 200 feet LOC: 400 feet
RWY 4 ILS or LOC/DME	ILS All Aircraft Categories: ½ mile LOC Aircraft Categories A and B: ½ mile LOC Aircraft Categories C and D: 1 mile	ILS: 200 feet LOC: 500 feet
RWY 4 ILS	All Categories of Aircraft: 252 feet	14 feet
RWY 4 ILS (CAT II & III)	All Categories of Aircraft: 136 feet	12 feet
RWY 4 RNAV (GPS)	All Aircraft Categories: 1¼ mile	500 feet
RWY 22 RNAV (GPS)	All Aircraft Categories: ¾ mile	403 feet

Notes: ILS = Instrument Landing System, LOC = Localizer, RWY = Runway, DME = Distance Measuring Equipment, RNAV = Area Navigation, GPS = Global Positioning System, MSL = Mean Sea Level

Source: FAA Southeast Terminal Procedures, Date 22 June 2017 to 22 July 2017

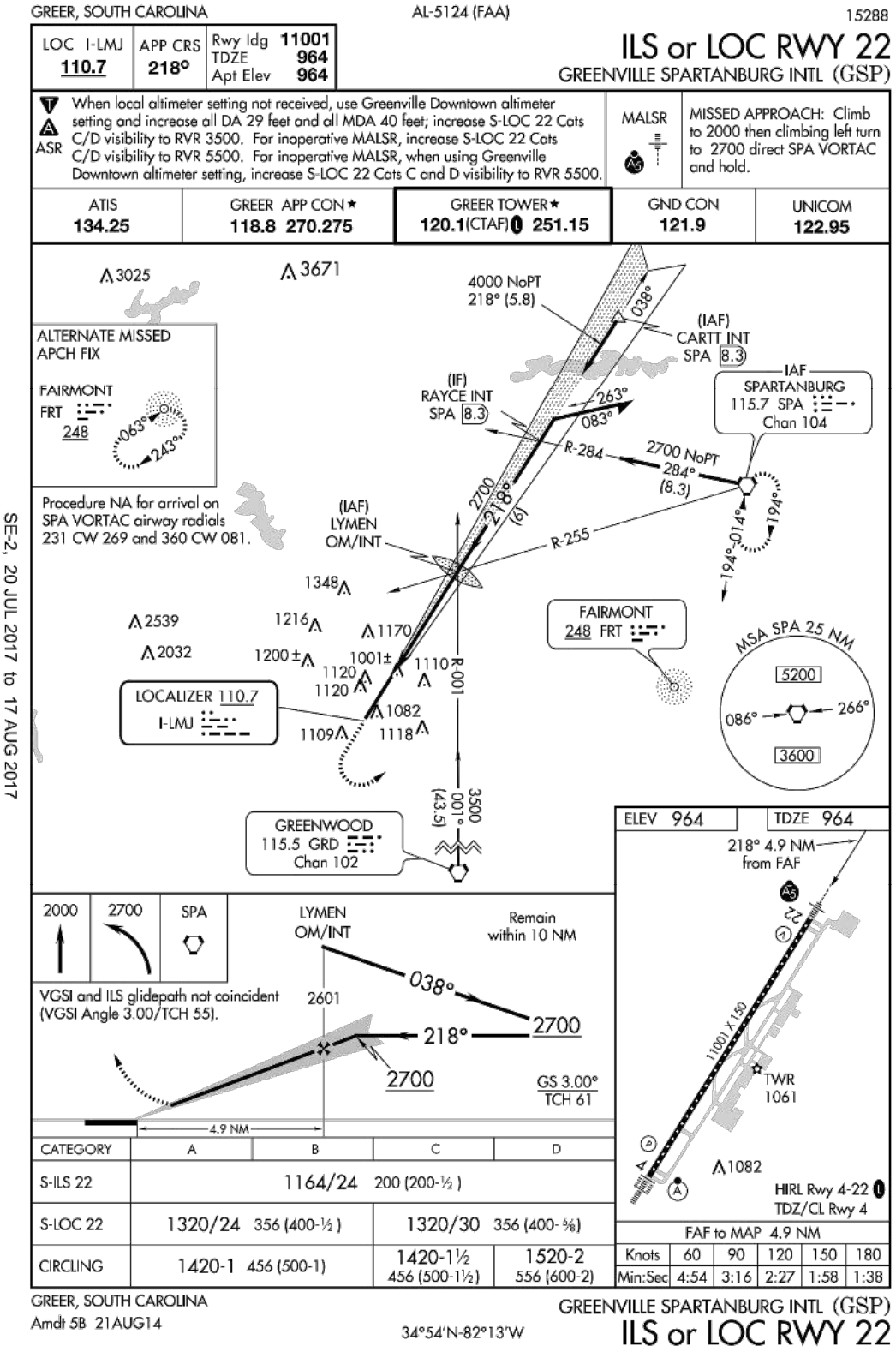
Instrument Landing System

An instrument landing system (ILS) provides horizontal and vertical guidance to a runway end, which allows pilots to land aircraft when visual navigation is limited. The ILS is used in poor weather with low visibility conditions. The ILS procedures for Runways 4 and 22 are included in Figure 2-7 through Figure 2-10.

The electronic components that comprise the ILS are the localizer, glide slope, outer marker, and middle marker. The localizer (LOC) signal is used to establish and maintain the aircraft's horizontal position until visual contact confirms the runway alignment and location. The glide slope is an electronic transmitter that emits signals used to establish and maintain the aircraft's descent rate until a pilot can visually confirm the runway alignment and location. The outer marker radiates a signal that marks the point at which glide slope altitude is verified or at which descent without glide slope is initiated. The middle marker radiates a signal that marks the decision point of the ILS approach.

Approach lighting systems are used in conjunction with an ILS to assist pilots transitioning from instrument to visual conditions.

Figure 2-7: Runway 22 ILS or LOC



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\APPROACH PROCEDURES.dwg

Figure 2-8: Runway 4 ILS or LOC-DME

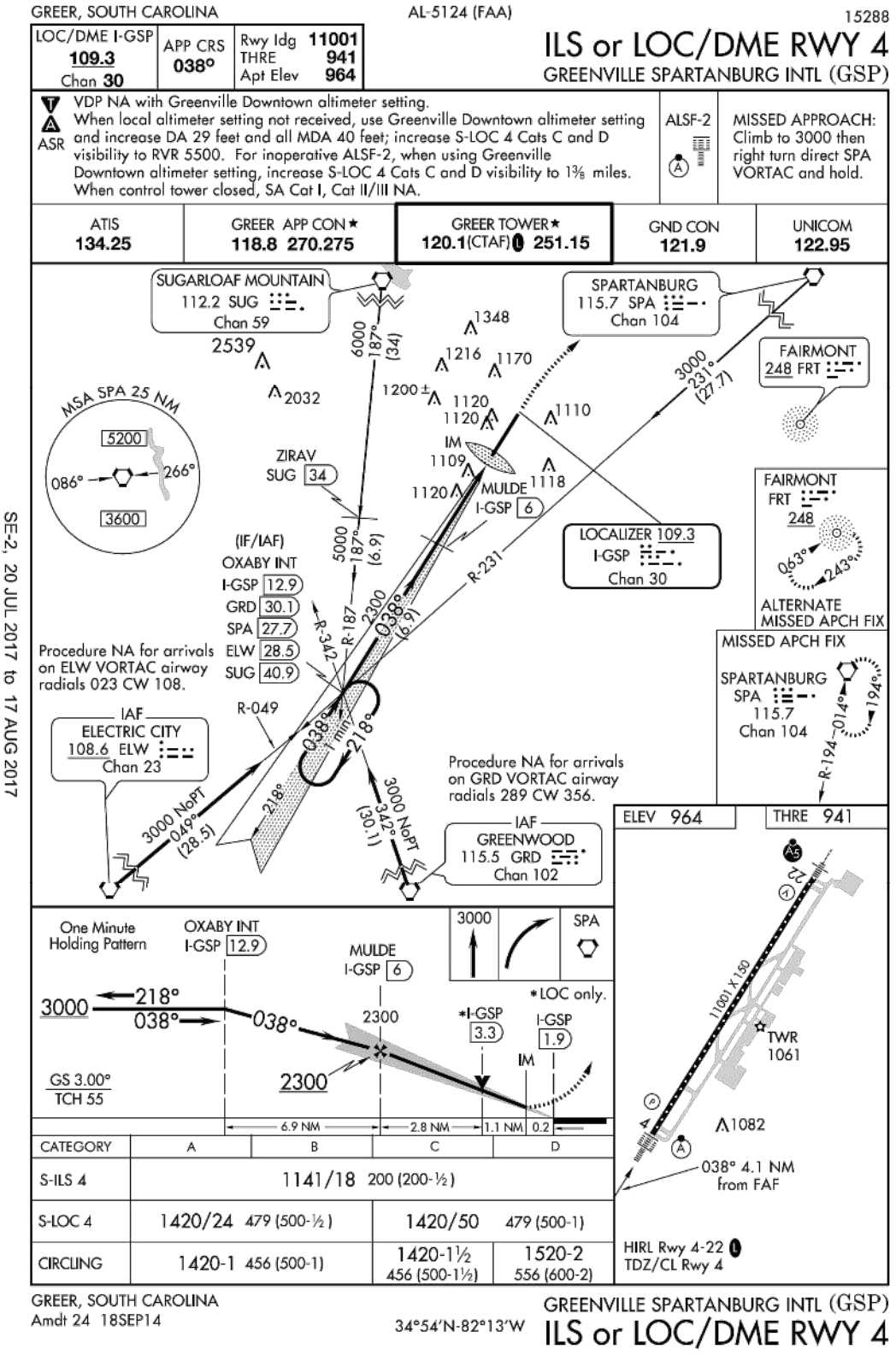
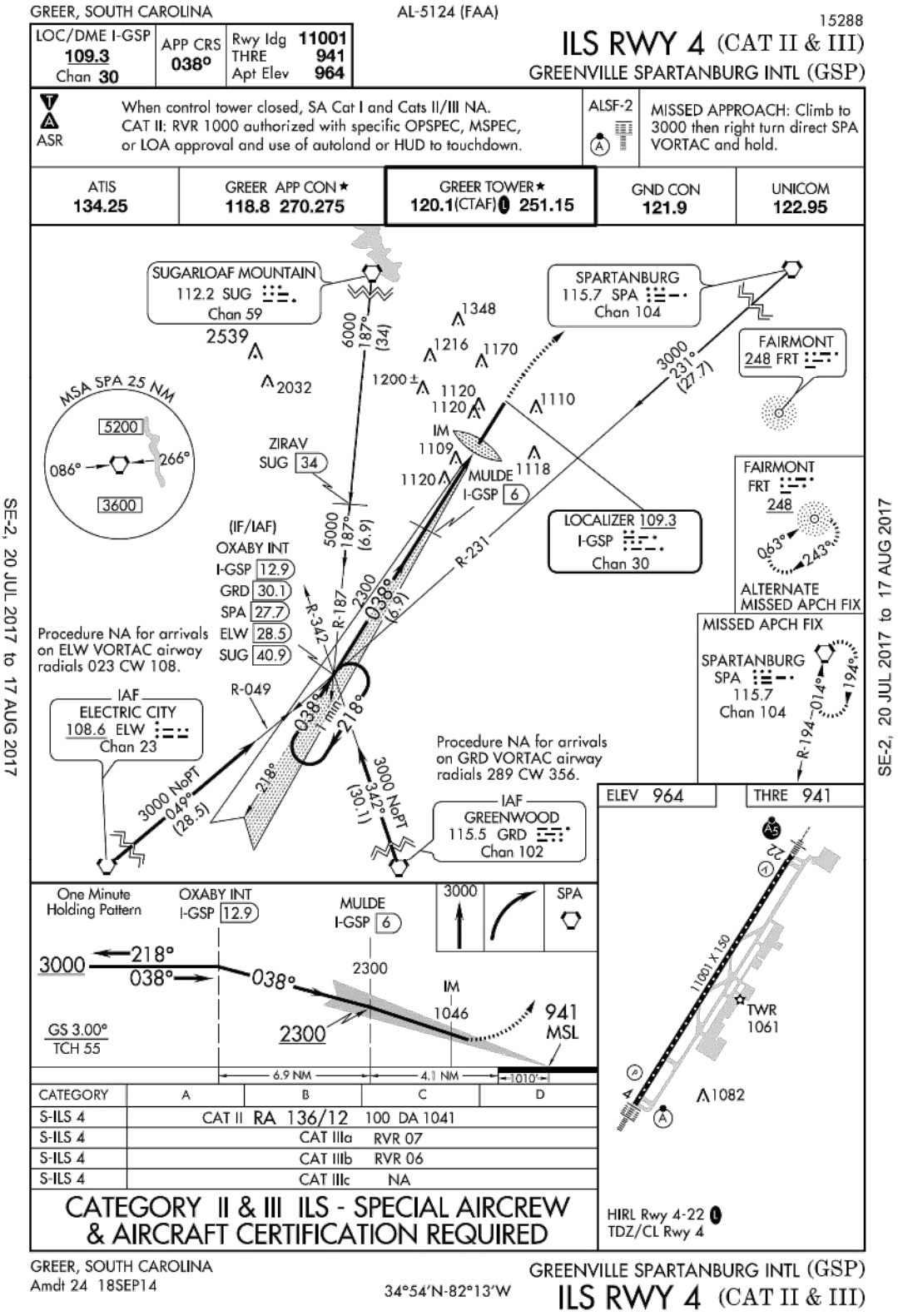
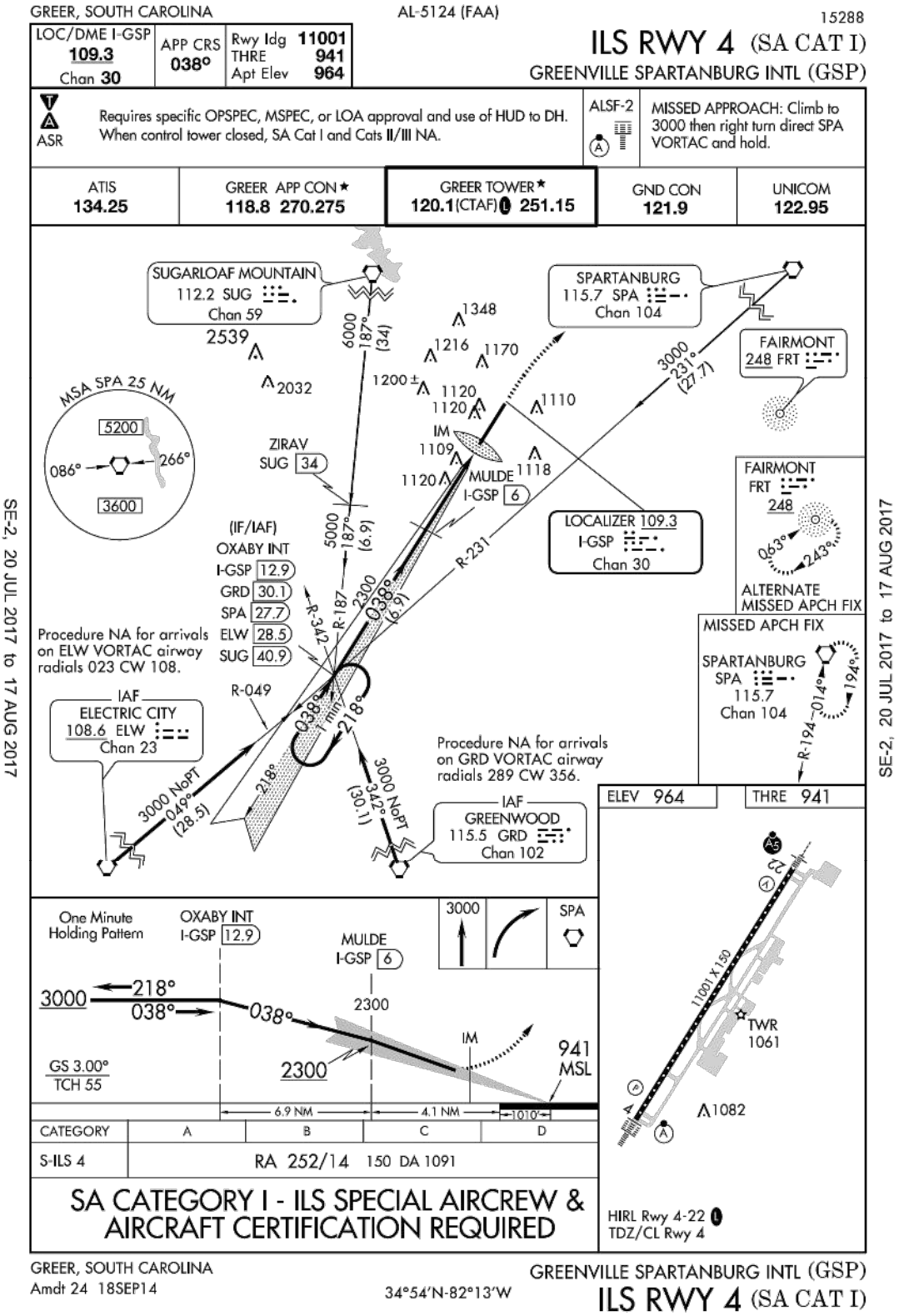

GREER, SOUTH CAROLINA
AL-5124 (FAA)
15288
ILS or LOC/DME RWY 4
GREENVILLE SPARTANBURG INTL (GSP)
LOC/DME I-GSP 109.3 Chan 30
APP CRS 038°
Rwy Idg 11001
THRE 941
Apt Elev 964
VDP NA with Greenville Downtown altimeter setting.
When local altimeter setting not received, use Greenville Downtown altimeter setting and increase DA 29 feet and all MDA 40 feet; increase S-LOC 4 Cats C and D visibility to RVR 5500. For inoperative ALSF-2, when using Greenville Downtown altimeter setting, increase S-LOC 4 Cats C and D visibility to 1⅜ miles. When control tower closed, SA Cat I, Cat II/III NA.
ASR
ALSF-2
MISSED APPROACH: Climb to 3000 then right turn direct SPA VORTAC and hold.
ATIS 134.25
GREER APP CON 118.8 270.275
GREER TOWER 120.1(CTAF) 251.15
GND CON 121.9
UNICOM 122.95
SUGARLOAF MOUNTAIN 112.2 SUG Chan 59
SPARTANBURG 115.7 SPA Chan 104
FAIRMONT 248 FRT
MSA SPA 25 NM
5200
086°
266°
3600
ZIRAV
SUG 34
IM
MULDE
I-GSP 6
LOCALIZER 109.3
I-GSP Chan 30
(IF/IAF)
OXABY INT
I-GSP 12.9
GRD 30.1
SPA 27.7
ELW 28.5
SUG 40.9
Procedure NA for arrivals on ELW VORTAC airway radials 023 CW 108.
IAF
ELECTRIC CITY
108.6 ELW Chan 23
Procedure NA for arrivals on GRD VORTAC airway radials 289 CW 356.
IAF
GREENWOOD
115.5 GRD Chan 102
FAIRMONT FRT 248
ALTERNATE MISSED APCH FIX
MISSED APCH FIX
SPARTANBURG SPA 115.7 Chan 104
ELEV 964
THRE 941
TWR 1061
11001 X 150
A1082
038° 4.1 NM from FAF
HIRL Rwy 4-22
TDZ/CL Rwy 4
One Minute Holding Pattern
OXABY INT I-GSP 12.9
MULDE I-GSP 6
3000
218°
038°
2300
GS 3.00°
TCH 55
*LOC only.
*I-GSP 3.3
I-GSP 1.9
6.9 NM
2.8 NM
1.1 NM
0.2
CATEGORY | A | B | C | D
S-ILS 4 | 1141/18 200 (200-½)
S-LOC 4 | 1420/24 479 (500-½) | 1420/50 479 (500-1)
CIRCLING | 1420-1 456 (500-1) | 1420-1½ 456 (500-1½) | 1520-2 556 (600-2)
GREER, SOUTH CAROLINA
Amdt 24 18SEP14
34°54'N-82°13'W
GREENVILLE SPARTANBURG INTL (GSP)
ILS or LOC/DME RWY 4
SE-2, 20 JUL 2017 to 17 AUG 2017
SE-2, 20 JUL 2017 to 17 AUG 2017

Figure 2-9: Runway 4 ILS



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\APPROACH PROCEDURES.dwg

Figure 2-10: Runway 4 ILS (CAT II & III)



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\APPROACH PROCEDURES.dwg

Distance Measuring Equipment

Distance measuring equipment (DME) is often used as an aid to the ILS and is therefore often collocated with the ILS. DME provides pilots with a slant range measurement of distance to the runway in nautical miles. In many installations, the DME augments or replaces the markers within the ILS system. Runway 4 has DME in coordination with the localizer to support the ILS.

RNAV/GPS Approaches

Properly equipped aircraft can use global positioning systems (GPS) provided by satellites for approach procedures to the Airport. The area navigation (RNAV) GPS procedures for Runway 4 and Runway 22 are included in **Figure 2-11** and **Figure 2-12**.

Visual Approach Aids

For visual guidance, Runway 4 is equipped with a four-light PAPI to left of the runway with a standard three-degree glide path and Runway 22 has a four-light PAPI to the right of the runway with a standard three-degree glide path.

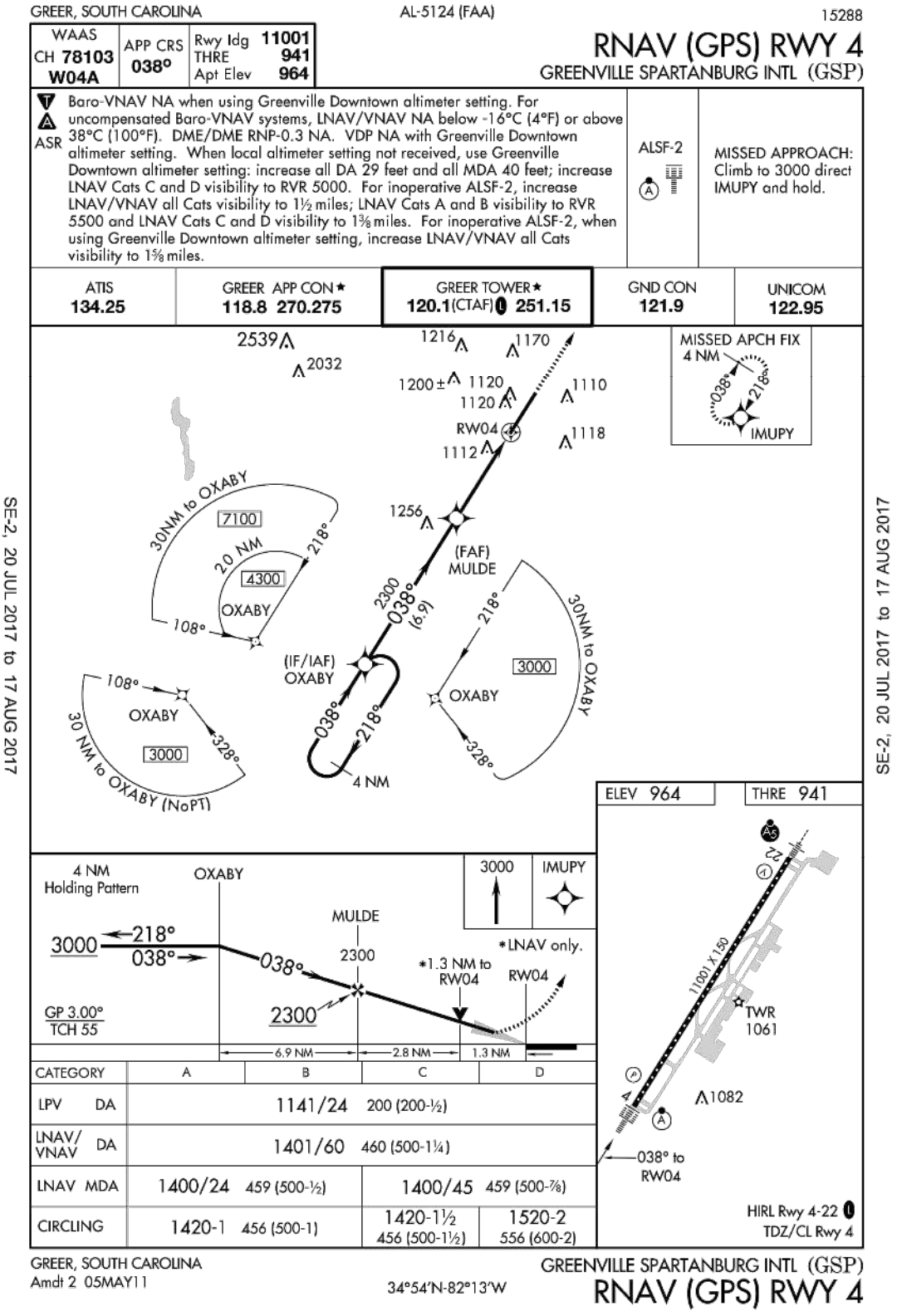
Automated Surface Observing System

Weather reporting equipment at GSP consists of an automated surface observing system (ASOS) that provides continuous minute-by-minute observations and performs basic observation functions necessary to generate an aviation routine weather report (METAR) and other aviation weather information. An ASOS has the capability to report altimeter, wind, temperature/dew point, density altitude, visibility, clouds/ceiling, precipitation, and remarks. The ASOS is located south of the commercial service/south cargo apron and operated by the National Weather Service (NWS).

Low Level Wind Shear Alert System

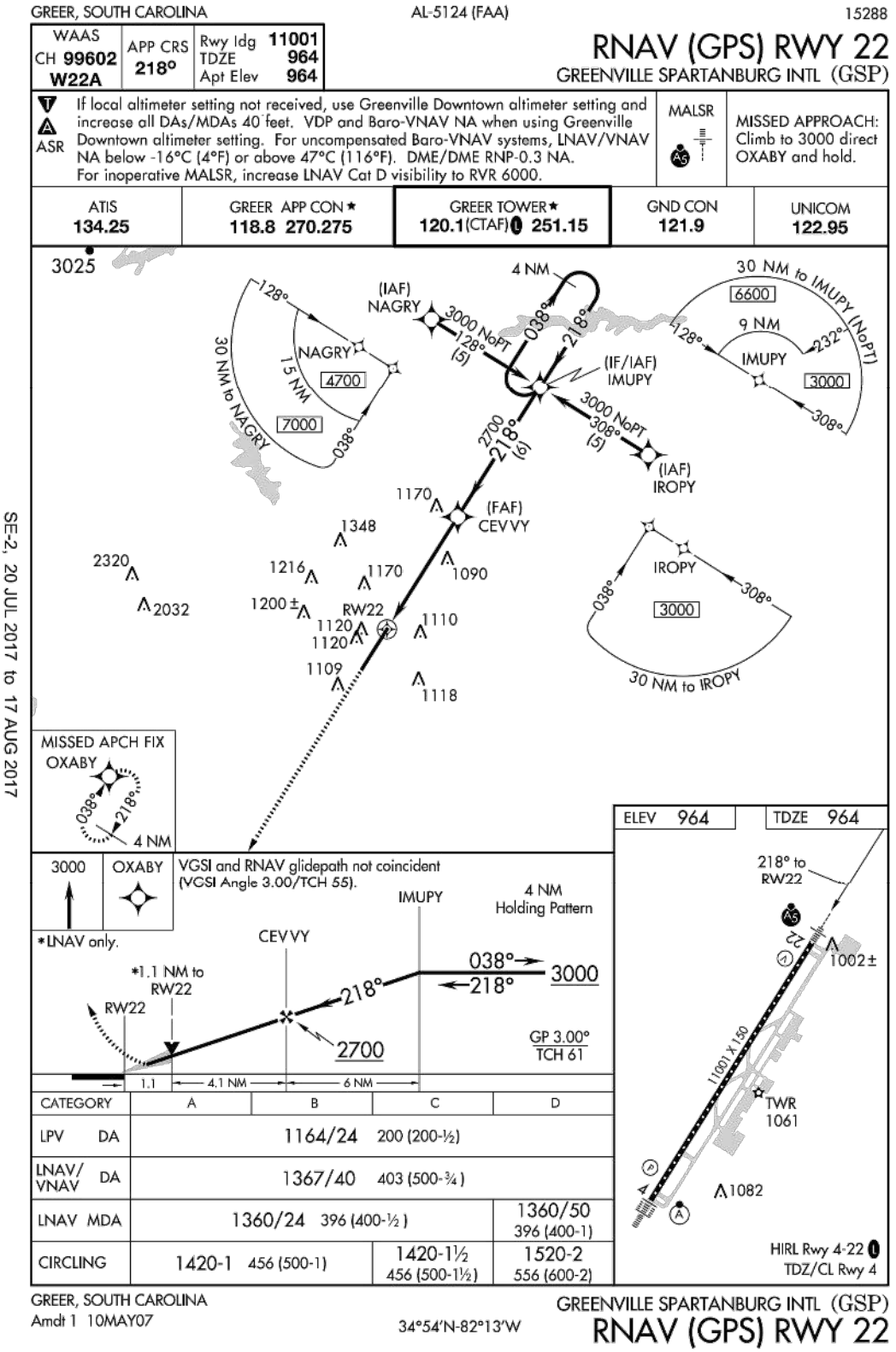
There is a low level wind shear alert system (LLWAS) to the southwest of Runway 4 end. This is a ground-based system used to identify weather conditions involving wind shear and microbursts cause by storm activity (gusts and downdrafts), temperature inversions, and surface obstructions around an airport and near runways. Wind shear is defined by the FAA as a change in wind speed and/or direction over a short distance. This change can take place over vertical and horizontal distances and can pose a great threat to safety during landing and departing operations at an airfield. The LLWAS at GSP aids in maintaining the safety and awareness of pilots using the airport through a series of sensor stations located around the Airport and near the Runway along the approach and departure paths.

Figure 2-11: Runway 4 RNAV (GPS)



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\APPROACH PROCEDURES.dwg

Figure 2-12: Runway 22 RNAV (GPS)



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\APPROACH PROCEDURES.dwg

Wind Cones

The primary wind cone located on the airfield is lighted and located within a segmented circle on the northwest side of the Runway. A segmented circle performs two functions; it aids the pilot in locating airports and it provides a centralized location for indicators and signal devices that may be required on an airport. Segmented circles are required at airports receiving FAA funds and are particularly helpful to pilots at non-towered airports. Two supplemental wind cones are installed on the airfield, one on each end of Runway 4-22.

Airfield Lighting

In 2006, GSP updated its airfield lighting system by replacing runway and taxiway edge-lighting and the supporting electrical wiring system. A computer control system was also installed to monitor and alert airport maintenance when a failure in the lighting system occurs. As part of this upgrade, the current regulators and emergency back-up generator for the airfield were replaced. Currently, airfield lighting for runways, taxiways, lighted directional signs and other signage is powered from the airfield electrical vault and provided with backup power by a collocated emergency generator.

Runway Approach Lighting

As previously discussed, the ALSF-2 is a robust, 2,400-foot, approach lighting system which provides visual information on runway alignment, height perception, roll guidance, and horizontal references to specifically support up to Category II/III instrument approaches. The 2,400-foot long MALSR system supplements approaches to Runway 22 by providing runway alignment and height perception information to pilots to support CAT I approaches. Each approach lighting system is equipped with an emergency back-up generator and are owned and operated by the FAA.

Runway In-Pavement Lighting

Centerline Lighting

Runway centerline lighting system (RCLS) are installed on some precision runways to better facilitate runway identification and alignment recognition by pilots of approaching aircraft. When viewed from the landing threshold, the runway centerline lights are white until the last 3,000 feet of the runway. The white lights begin to alternative with red for the next 2,000 feet and for the last 1,000 feet of useable runway the lights are all red. The RCLS at GSP is bi-directional and as such supplement approaches to both Runway 4 and Runway 22.

Touchdown Zone Lighting

Touchdown zone lights (TDZL) are installed on some precision approach runways to indicate the touchdown zone when landing under adverse visibility conditions. They consist of two rows of transverse light bars located symmetrically about the runway centerline. The system consists of steady-burning white lights which start 100 feet beyond the landing threshold and extend to 3,000 feet beyond the landing threshold or to the midpoint of the runway, whichever is less. At GSP, TDZL are installed on Runway 4 only as required to support the CAT II/III approaches to that runway end.

Taxiway Centerline Lead-Off Lights

Taxiway centerline lead-off lights provide visual guidance to persons exiting the runway. They are color-coded to warn pilots and vehicle drivers that they are within the runway environment. Taxiway centerline lead-off lights are installed on all rapid-exit taxiways at GSP.

Taxiway Lighting

All taxiways at GSP are equipped with high intensity taxiway lighting (HITL) along the edge of pavement. No in-pavement taxiway lighting exists other than the taxiway centerline lead-off lights installed on rapid-exit taxiways, Taxiways D, E, F and G. Additionally, all taxiways which access Runway 4-22, with exception to Taxiway F and Taxiway G, have in-pavement stop bar lights installed. These red, unidirectional lights are installed across the entire taxiway at the runway hold position markings.

Airport Beacon

The Airport's rotating beacon is located on top of the Air Traffic Control Tower (ATCT) and provides a visual navigation aid for aircraft. The beacon is equipped with an optical rotating system that projects two beams of light; one green and one white or clear, 180 degrees apart, in accordance with FAA criteria. These colors indicate that the Airport is a civil airport. The GSP rotating beacon is operational when the airport is open and turned off when the Airport is closed to traffic.

2.3. AIRSPACE PROCEDURES AND AIR TRAFFIC CONTROL

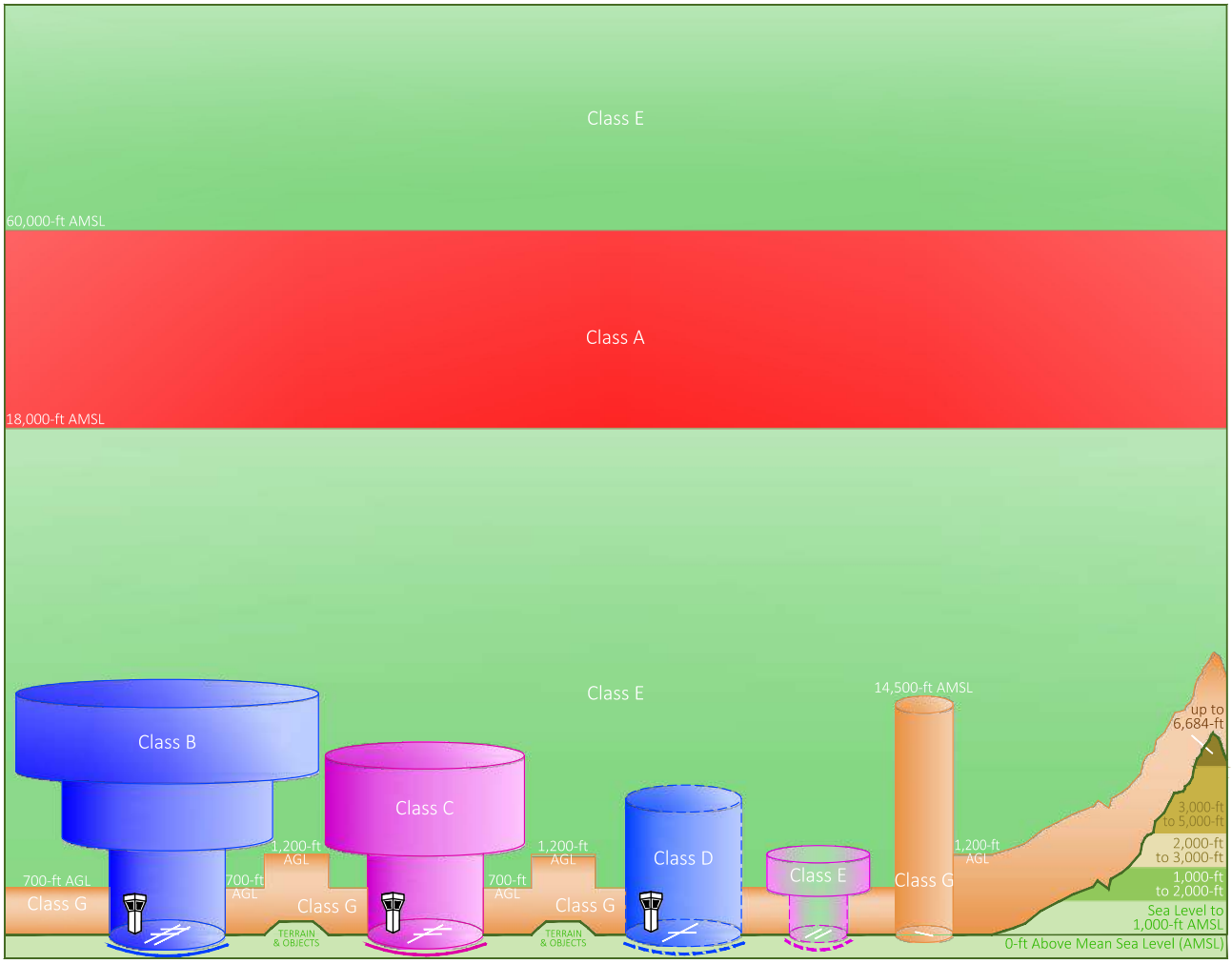
Airspace in the United States is designated with the letters A through G (not including F). A summary of each of these types of airspace is depicted in **Figure 2-13** and the airspace surrounding GSP is shown in **Figure 2-14**. GSP operates under Class C airspace when the control tower is operating and under Class E for all other hours.

- **Class A:** All airspace between 18,000 feet MSL and 60,000 feet AGL. Class A airspace contains all high-altitude airways (jet routes).

- **Class B:** Airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. Each Class B airspace is uniquely tailored to the airport and its vicinity. Class B airspace can resemble an upside-down wedding cake having different tiers with different elevations. ATC clearance is required for aircraft to enter Class B airspace. Charlotte Douglas International Airport (CLT) and Hartsfield-Jackson Atlanta International Airport (ATL) are the closest airports to GSP surrounded by Class B airspace.

- **Class C:** Airspace from the surface up to 4,000 feet above the airport elevation surrounding airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Class C airspace is individually tailored, but generally the airspace consists of a 5 nautical mile (NM) tier from the surface to 4,000 feet AGL and a 10 NM shelf that extends from 1,200 feet up to 4,000 feet AGL. GSP is currently operating under Class C Airspace. GSP's Class C airspace has a 5 NM tier from the surface to 5,000 feet and a 10 NM tier with a northwestern appendage extending from 3,100 feet to 5,000 feet and a southeaster section extending from 2,200 feet to 5,000 feet.

Figure 2-13: Generalized Airspace Schematic



Communication Requirements and Weather Minimums

	Class A	Class B	Class C	Class D	Class E	Class G
Minimum Pilot Qualification	Instrument Rating	Student *	Student *	Student *	Student *	Student *
Entry Requirements	IFR: ATC Clearance VFR: Operations Prohibited	ATC Clearance	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: None	None
VFR Visibility Below 10,000 AMSL **	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	3 Statute Miles	Day: 1 Statute Mile Night: 3 Statute Miles
VFR Cloud Clearance Below 10,000 AMSL	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal ***
VFR Visibility 10,000 AMSL and Above **	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	5 Statute Miles	5 Statute Miles
VFR Cloud Clearance 10,000 AMSL and Above	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 1 Statute Mile Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal
Airport Application	N/A	• Radar • Instrument Approaches • Weather • Control Tower • High Density	• Radar • Instrument Approaches • Weather • Control Tower	• Instrument Approaches • Weather • Control Tower	• Instrument Approaches • Weather	
Special VFR Permitted?	No	Yes	Yes	Yes	Yes	N/A

* Prior to operating within Class B, C, or D airspace (or Class E airspace with an operating control tower), student, sport, and recreational pilots must meet the applicable FAR Part 61 training and endorsement requirements. Solo student, sport, and recreational pilot operations are prohibited at those airports listed in FAR Part 91, Appendix D, Section 4.
** Student pilot operations require at least 3 statute miles visibility during the day and 5 statute miles visibility at night.
*** Class G VFR cloud clearance at 1,200 AGL and below (day): clear of clouds.

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\AIRSPACE.dwg

Figure 2-14: Surrounding Airspace

Source: Atlanta Sectional Aeronautical Chart

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\AIRSPACE.dwg

- **Class D:** The terminal area airspace surrounding non-hub commercial airports with a radius of five statute miles. Generally, Class D extends from the surface to 2,500 feet.

- **Class E:** General and en-route airspace that includes most of the remaining airspace not designated as A through D. This airspace contains low altitude airways often called Victor Airways. In the GSP region, the Class E airspace begins at the surface to the southeast from the Spartanburg Downtown Memorial Airport (SPA) and extends to the floor of the Class C airspace. The remainder of Class E airspace surrounding GSP begins at 700 feet AGL and extends to the floor of the Class C.

- **Class G:** Uncontrolled airspace that exists between the ground and 700 feet AGL, within and beyond the limits of the GSP Class C area, except within the airspace surrounding SPA.

- **Special Use Airspace:** There are three special use areas adjacent to GSP. The Snowbird Military Operations Area (MOA) is approximately 44 NM to the northwest and the Gamecock MOA is approximately 74 NM to the southeast. There is also Alert Area A-685, which is over 80 NM to the west of GSP.

- **En-Route Airspace:** Aircraft flying inbound to or outbound from GSP typically follow designated routes between ground based NAVAIDs. The primary en-route NAVAID in this region is the Spartanburg VOR.

There is other controlled airspace near GSP including Class E airspace for Greenville Downtown Airport, Spartanburg Downtown Memorial Airport, Donaldson Center Airport, Laurens County Airport, and Class C airspace for Asheville Regional Airport.

2.3.1. Air Traffic Control Facilities

The Greer Air Traffic Control Tower (GSP ATCT) is located on the north end of the terminal building on the commercial terminal apron. The tower is open from 0600 to 2345 local time and provides air traffic and ground control services throughout its availability. The approach control is between Charlotte Approach and Atlanta Approach, with Asheville Approach to the north and Columbia and Augusta Approach to the south. Air Traffic Control has eight center sectors that are either adjacent to or overlay the airspace. GSP ATCT issues approach control services for 10 airports in the region, including Greenville Downtown and Donaldson Center. Terminal Radar Approach Control (TRACON) is provided during hours of operation. Atlanta Air Route Traffic Control Center (ARTCC) provides approach and departure procedures when the tower is closed. During ATCT hours of operation, aircraft require two-way radio communications and a Mode C transponder before entering the airspace.

GSP has an airport surveillance radar (ASR) located east of the commercial service terminal area. An ASR is a radar system that detects and displays aircraft in the airspace around the airport at which it is located. The ASR at GSP detects aircraft in an approximately 60-mile radius. When the ATCT is closed, a common traffic advisory frequency (CTAF) is used to keep the airport open for air traffic.

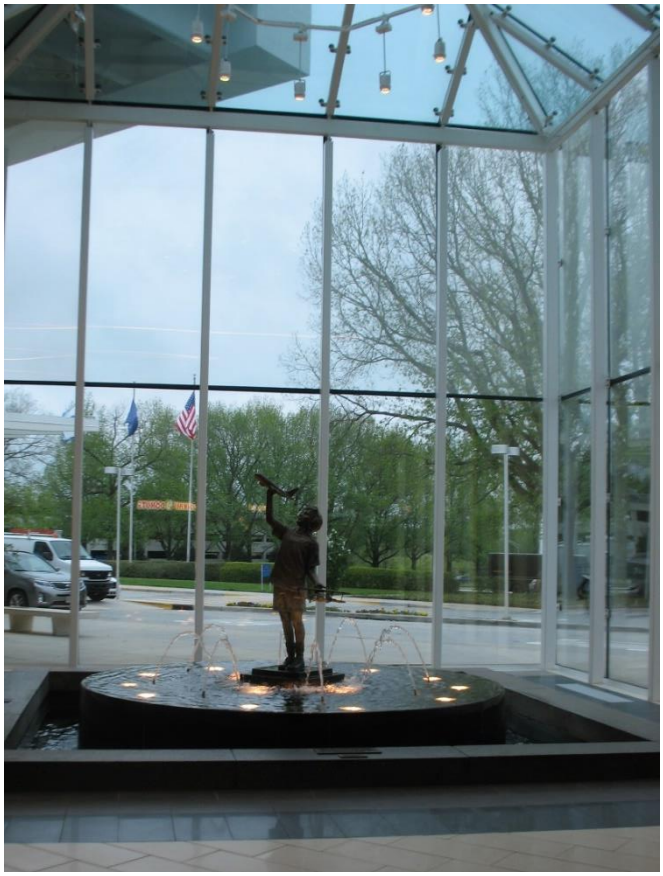
2.4. LANDSIDE FACILITIES

The existing landside facilities at GSP include the general location of buildings, hangars, and other airports and tenant facilities. Landside facilities are discussed under the following headings:

- Passenger Terminal Facilities
- General Aviation Facilities
- Cargo Facilities
- Airport Support Facilities
- Utility Infrastructure
- Regional Access, Airport Parking and Ground Transportation

The existing landside facilities are depicted in **Figure 2-15.**

2.4.1. Passenger Terminal Facilities



The passenger terminal complex at GSP recently underwent a major renovation and revitalization effort focused on increasing capacity, improving efficiency and elevating the aesthetics of the terminal building and its surroundings. The passenger terminal complex consists of the Main Terminal and two concourses, designated as Concourse A (south) and Concourse B (north). Together, these facilities total approximately 322,446 square feet and serve major and commuter airlines across 13 gates. The Main Terminal has three floors and a basement. The first floor is designated as the Ticketing Level and is unsecure. The Grand Hall is to the floor above, a two-story area with amenities at the Apron Level and Concourse Level that requires passage through security prior to entry. Two transportation cores containing stairs, escalators, and elevators transport passengers between the Ticketing Level and the levels located in the Grand Hall. The terminal facilities are currently utilized by commercial airlines including Allegiant Air (Allegiant), American Airlines (American), Delta Air Lines (Delta), Southwest Airlines (Southwest), and United Airlines (United) as well as multiple concessionaires.

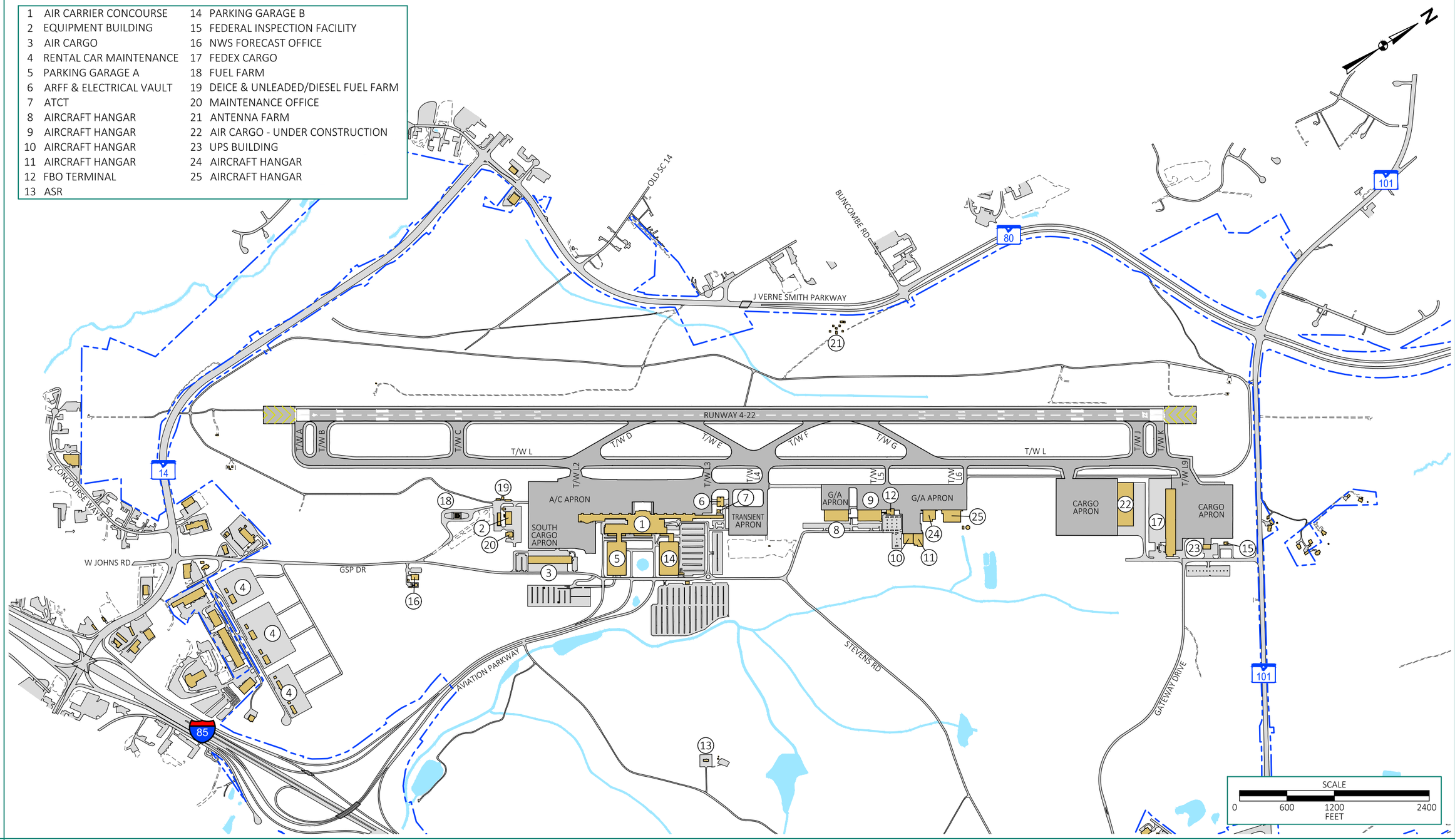
For clarity throughout this section, the passenger terminal complex has been sub-divided by function. In the discussion and drawings that follow, these functional areas have been color-coded:

- Airline Areas (Dark Blue) – the area dedicated to airline functions include; check-in (counters and kiosks), check-in queue, airline offices, holdrooms, inbound baggage input area, baggage claim retrieval area, baggage services offices, and baggage make-up area.
- Concessions and Amenities (Green) – The concessions and amenities terminal utilization areas include; food/beverage areas, kitchen facilities, retail spaces, rental car areas, office/storage areas, and other revenue areas.
- Security/Federal Inspection Stations (Light Blue) – the security/federal inspection stations utilization areas include all areas within the terminal that staff and administer security services for the Main Terminal, Concourse A or Concourse B.
- Public and Circulation (Yellow) – the public and circulation terminal utilization areas include; unenclosed areas and public areas, secure or non-secure.
- Non-Public Areas (Magenta) – the non-public terminal utilization areas include; airport administration and mechanical/electrical/building system.

Page intentionally left blank.

Figure 2-15: Landside Facilities

1	AIR CARRIER CONCOURSE	14	PARKING GARAGE B
2	EQUIPMENT BUILDING	15	FEDERAL INSPECTION FACILITY
3	AIR CARGO	16	NWS FORECAST OFFICE
4	RENTAL CAR MAINTENANCE	17	FEDEX CARGO
5	PARKING GARAGE A	18	FUEL FARM
6	ARFF & ELECTRICAL VAULT	19	DEICE & UNLEADED/DIESEL FUEL FARM
7	ATCT	20	MAINTENANCE OFFICE
8	AIRCRAFT HANGAR	21	ANTENNA FARM
9	AIRCRAFT HANGAR	22	AIR CARGO - UNDER CONSTRUCTION
10	AIRCRAFT HANGAR	23	UPS BUILDING
11	AIRCRAFT HANGAR	24	AIRCRAFT HANGAR
12	FBO TERMINAL	25	AIRCRAFT HANGAR
13	ASR		



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\EXISTING.dwg

Page intentionally left blank.

Figure 2-16 through Figure 2-18 depict each level of the passenger terminal complex.

Airline Areas

The air carriers at GSP have space designations for various functions on each floor. The Ticketing Level houses 46 check-in desks in the check-in hall as well as 46 bag wells. There are no baggage-drop locations other than those located at baggage wells. Airlines' space allocation within the terminal building is based upon current lease agreements and includes ticketing counters, operations/office space, and baggage/storage areas. Each individual check-in desk measures three feet-four inches. Each baggage well measures two feet-four inches.

Several of the check-in desks serve as kiosks, with the following distribution across the airlines:

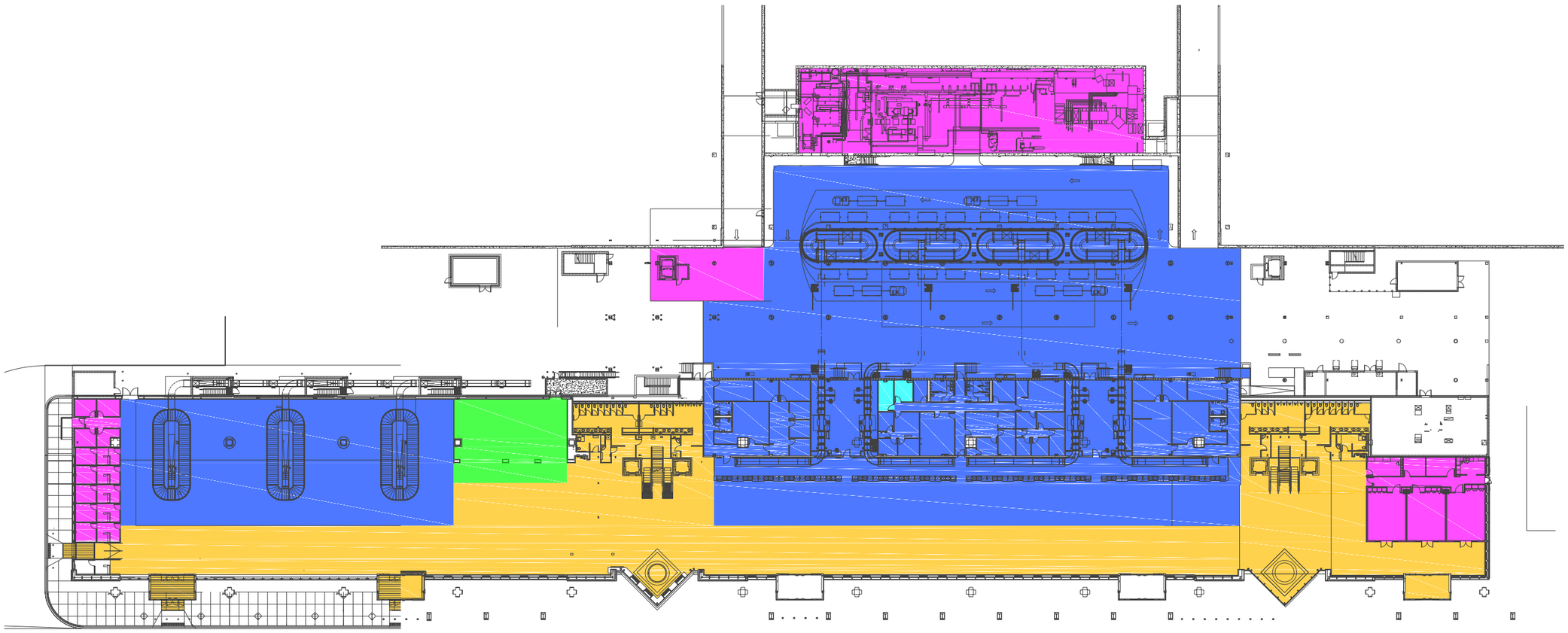
- American Airlines: four kiosks at five check-in desks
- Delta Airlines: six kiosks at seven check-in desks
- Southwest Airlines: four kiosks at five check-in desks
- United Airlines: five kiosks at five check-in desks
- Common-use desks: no kiosks at 17 check-in desks
- GSP District shared/per-turn-use: no kiosks at seven check-in desks

There is approximately 10 feet between the back edge of the check-in desk to the back wall. Within this area is located the take-away baggage belt, which occupies about five feet of the space. The remaining five feet of area is where check-in agents work to total approximately 2,000 square feet. The area in front of the check-in desks available for queueing measures approximately 200 feet in width. A designated area is set aside for direct flow from the curb to the baggage take-away belt. This allows for approximately 4,400 square feet for the queueing of passengers.

The airlines also have designated space on the Apron and Concourse Levels for operations, common and shared use, and the departure lounges each airline uses. The specific space allocation for airlines at GSP is shown in Table 2-6.

Page intentionally left blank.

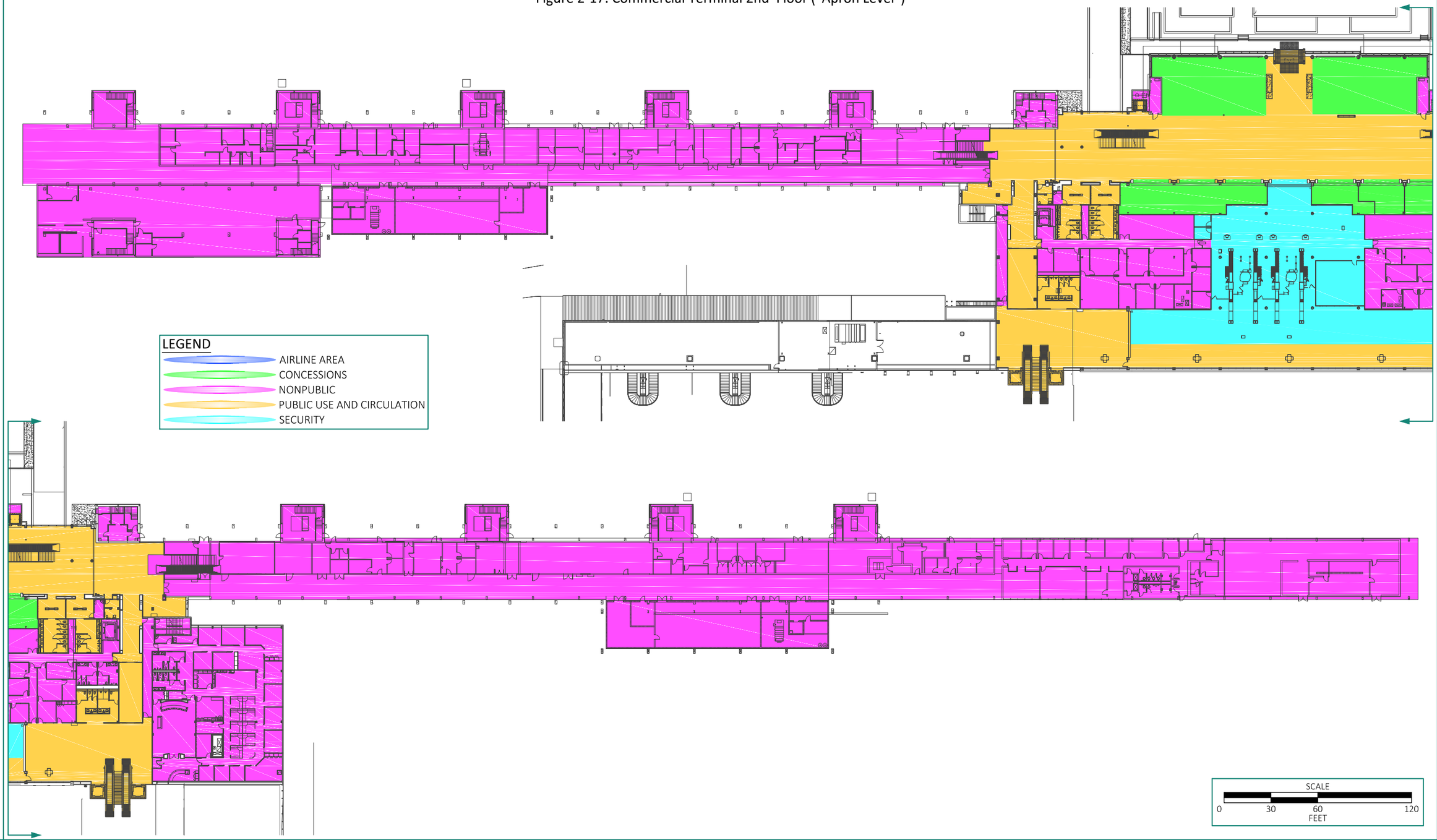
Figure 2-16: Commercial Terminal 1st Floor (“Ticketing Level”)



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TERMINAL.dwg

Page intentionally left blank.

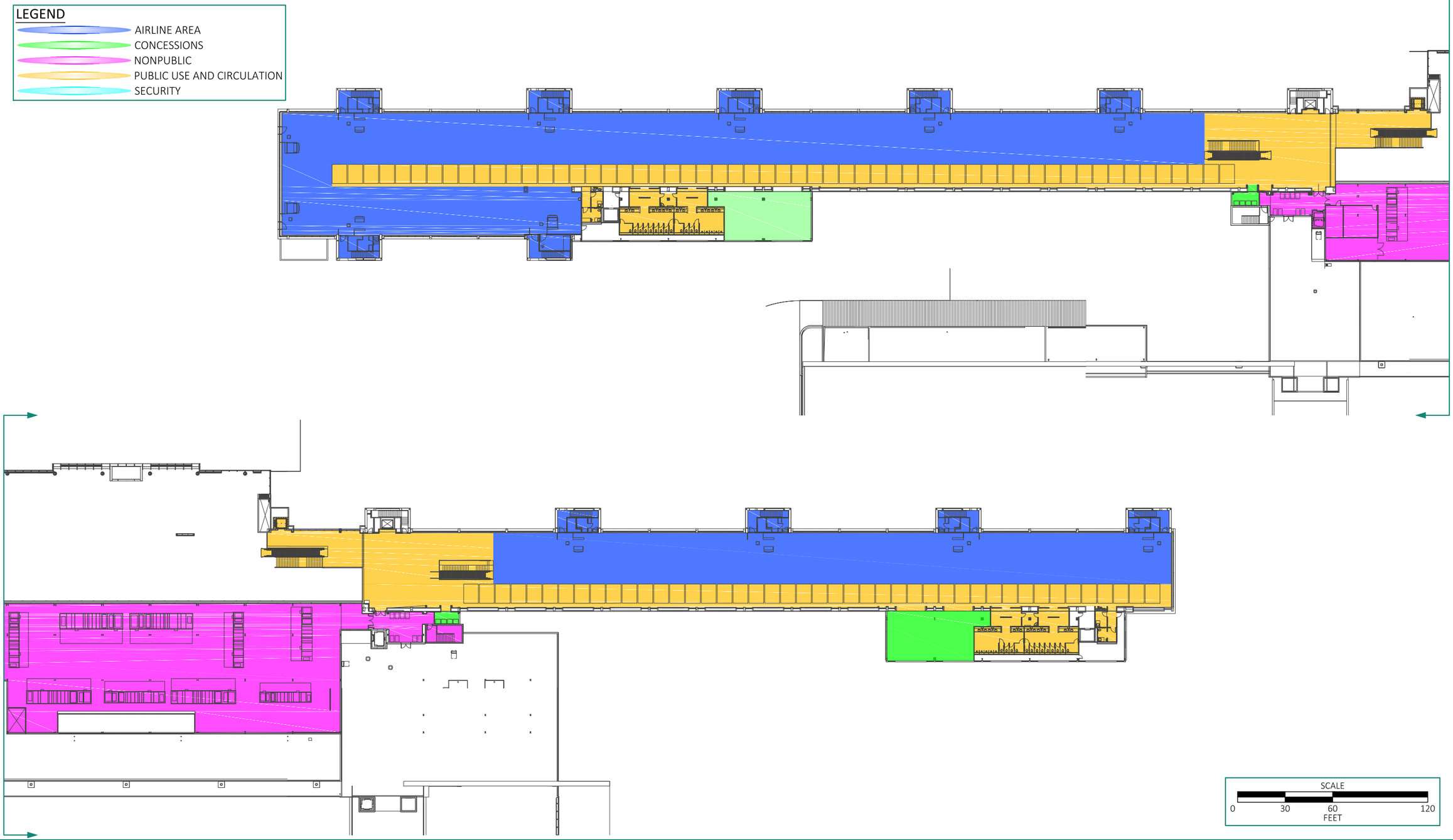
Figure 2-17: Commercial Terminal 2nd Floor ("Apron Level")



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TERMINAL.dwg

Page intentionally left blank.

Figure 2-18: Commercial Terminal 3rd Floor ("Concourse Level")



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TERMINAL.dwg

Page intentionally left blank.

Table 2-6: Commercial Terminal Airline Space Allocation

Airline Areas	Designated Space (Sq Ft)
Ticketing Level	
Airline Common Use: Baggage Carousels, Tug Drive, and Baggage Conveyors	51,886
Airline Ticket Offices	
Southwest	1,916
United	1,062
American	587
Delta	927
Allegiant	140
Shared Use	1,516
Vacant	2,483
Airline Ticket Counters and Queue (No. of Positions)	
Southwest (5)	1,031
United (5)	997
American (5)	986
Delta (7)	1,788
Delta Curbside Check-in (1)	55
Common Use - Allegiant and Charters (17)	2,887
Airline Baggage Service Offices	
Southwest	242
United	242
American	42
Delta	254
Vacant	436
Sub-Total	**69,477**
Apron Level	
Airline Operations Space	
Southwest	2,763
United	1,749
American	1,749
Delta	2,293
Airline Operations Space – Vacant	678
Airline Common Use	1,374
Airline Shared Use Space - Security Checkpoint Queue & Storage	11,521
Airline GSE Parking – Vacant	1,190
Sub-Total	**23,317**
Concourse Level	
Airline Departure Lounges and Stairs (gates)	2,977
Southwest (1)	5,780

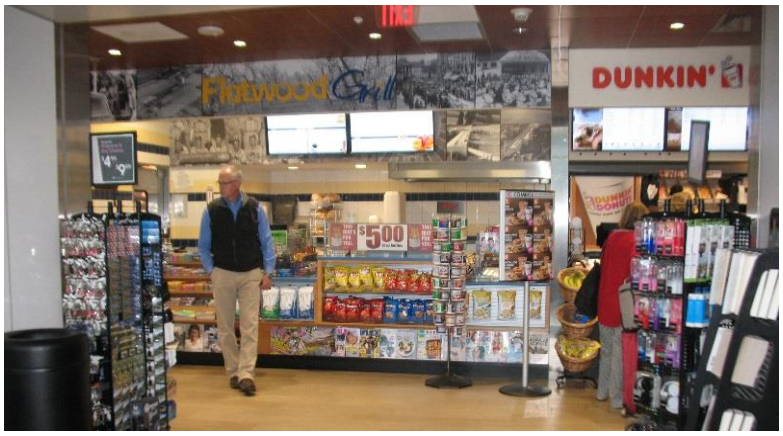
United (2)	8,933
American (4)	9,095
Delta (4)	12,535
Shared/Per Turn Use (4)	2,977
Sub-Total	42,297
Total Airline Use Space	**135,091**

Source: Greenville-Spartanburg International Airport District

Concessions and Amenities

Concessions and amenity areas include food and beverage services and retail shops. Restaurants and amenities are available on each level of the Main Terminal.

There are four concessionaires on the Ticketing Level of the terminal. The first, Atchison Transport, is a shuttle service located in the baggage claim area of the terminal. Food and beverages are available at Flatwood Grill and Dunkin Donuts and newspapers, magazines, and sundries are available at Hudson. Together the four concessions occupy approximately 3,406 square feet of area.



Once through security, passengers are given the opportunity to choose from multiple concessionaires located on each level of the Grand Hall. On the Apron Level of the Grand Hall, Upstate Market, Hudson, and Tech-on-the-Go provide news, gifts and travel sundries for passengers. Food and beverage is also available with options for Chick-Fil-A, Palmetto Distillery, Baskin-Robbins, Dunkin Donuts, and The Kitchen by Wolfgang Puck. The Apron Level also provides access to the Airport's Airside Garden.

The Concourse Level of the Grand Hall offers multiple concessions as well with Hudson located in each concourse. Food and beverage services are provided by Thomas Creek Hill in Concourse A and RJ Rocker's Flight Room in Concourse B. A Benefits Cosmetic kiosk located in Concourse A offers beauty products for purchase and Best Buy kiosks are located in both concourses. Each concourse also has designated space for passenger access to charging tables, circulation chairs, drinking fountain and water refill stations, massage chairs, and nursing rooms. Departure lounge space, public and circulation areas are discussed in subsequent sections of this report.

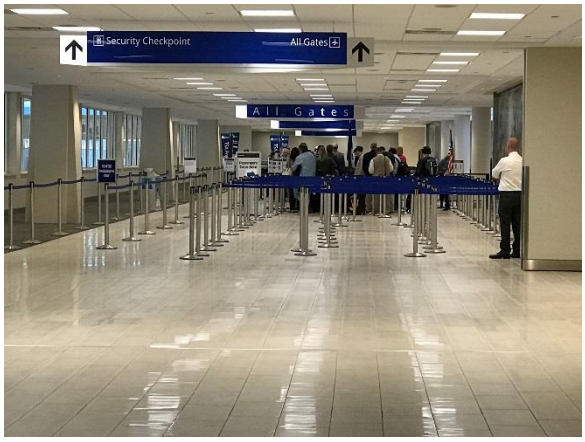
The specific space designated for concessionaires in the terminal is shown in Table 2-7.

Table 2-7: Commercial Terminal Concessionaire Space

Concessionaires	Designated Space (Sq Ft)
Ticketing Level	
Hudson, Flatwood Grill, and Dunkin' Donuts	2,844
Hudson Freezer	260
Atchison Transport	302
Sub-Total	**3,406**
Apron Level	
Chick-fil-A & DC-3	2,998
The Kitchen by Wolfgang Puck	2,999
Hudson	560
Upstate Market, Dunkin' Donuts, Baskin Robbins, Tech-on-the-Go, and Palmetto Distillery	3,419
Hudson Storage	818
Shared Use Storage	6,154
Sub-Total	**16,948**
Concourse Level	
Hudson – A Concourse	680
Hudson – B Concourse	600
Thomas Creek Grill – A Concourse	1,106
RJ Rockers Flight Room – B Concourse	2,327
Benefit Cosmetics – Concourse A	75
Best Buy – Concourses A & B	150
Sub-Total	**4,938**
Total Concession Use Space	**25,292**

Source: Greenville-Spartanburg International Airport District

Security and Baggage Screening, and Federal Inspection Stations



Passage through the Transportation Security Administration (TSA) screening area is required to enter the Grand Hall on the second floor of the Main Terminal. Passengers are queued on the non-secure side of the checkpoint in two lines, each coming from the escalators and elevators available on each side of the terminal. Each of the two queueing areas have approximately 5,600 square feet of area, of which only about 720 square feet on each side have queueing stanchions. Two podiums split passengers into four lanes available for passenger carry-on baggage screening. Of the four lines, two are equipped with magnetometers and two are equipped with full-body scanners. TSA offices are located on the secured side of the passenger screening area.

Checked baggage screening takes place behind the check-in counters in two separate rooms. The southern room measures approximately 34 feet by 40 feet for a total square foot area of 1,419 square feet. The northern room measures approximately 35 feet by 40 feet for a total square foot area of 1,435 square feet. Each room contains two baggage screening devices.

Additionally, CBP operates two federal inspection stations (FIS) at GSP. These facilities are responsible for inspecting all international passengers, baggage and air cargo. FIS inspections cover customs, immigration and agricultural and plant health concerns. Located beneath the south concourse (Concourse A), the first FIS facility is designed to accommodate 250 international travelers per hour when operating at full capacity. The second FIS is located on the northern cargo ramp area and accommodates cargo and corporate aircraft requiring international clearance. This facility consists of approximately 1,500 square feet and 18 vehicle parking stalls. The facility is in good condition and can be accessed by the public from Gateway Drive via Route 101. The establishment of these two facilities granted the airport its international status.

Public and Circulation Areas

Public and circulation areas within the GSP terminal include restrooms, conference rooms, waiting and seating areas not leased by airlines, and circulation corridors. Space is also designated for passenger circulation including the entrances/exits and the lobby. The area provided for each of these functions is accounted for in Table 2-8.

Table 2-8: Commercial Terminal Public Areas

Public and Circulation Areas	Designated Space (Sq Ft)
Ticketing Level	
Public Space	28,605
Apron Level	
Public Space	34,197
Concourse Level	
Public Space	34,221
Total Public Use Space	**97,023**

Source: Greenville-Spartanburg International Airport District

Non-Public Areas

Non-public areas within the GSP terminal include the administrative and government agency office suites and those areas reserved for mechanical/electrical/building systems. Together, these spaces occupy 128,729 square feet of the terminal building as shown in **Table 2-9**.

Table 2-9: Commercial Terminal Non-Public Areas

Non-Public Areas	Designated Space (Sq Ft)
Ticketing Level	
GSP District Counters – Shared/Per-Turn-Use	1,392
Government Agencies - Exclusive Use (TSA)	142
Government Agencies - Allocated to Airlines	2,854
Government Agencies - Common Use	398
Tenant/Other Exclusive	111
Shared Use	2,978
Sub-Total	**7,875**
Apron Level	
GSP District – Shared/Per-Turn-Use	435
GSP District Use - Police, Administrative, Operations, Janitor, Storage	22,904
Government Agencies - Exclusive Use (TSA)	5,174
Government Agencies - Common Use (Customs and Border Protection)	6,401
Government Agencies - Allocated to Airlines (Passenger Security Checkpoint)	7,054
Government Agencies – Vacant	936
Tenant/Other Exclusive	971
Tenant/Other Vacant	1,683
Other Leasable – Vacant	4,815
Shared Use Space	29,415
Support Space and Mechanical	12,010
Sub-Total	**91,798**
Concourse Level	

GSP District Use - Mechanical, Stairs, and Storage	1,639
Tenant/Other - Exclusive – Vacant	767
Shared Use	2,089
Support Space and Mechanical	24,561
Sub-Total	29,056
Total Non-Public Use Space	**128,729**

Source: Greenville-Spartanburg International Airport District

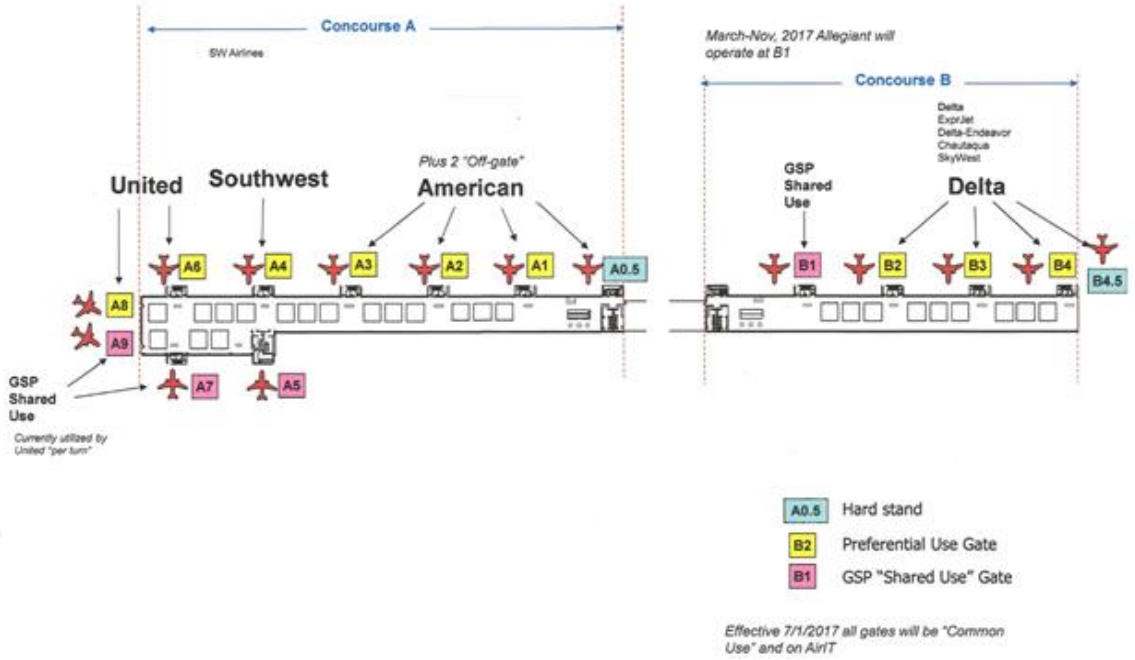
Gates and Boarding Bridges

As previously noted, there are five air carriers based at GSP: Allegiant, American, Delta, Southwest, and United. There are 13 gates providing aircraft access to the terminal and two hardstand parking positions. Each gate (Gates A1 through A9 and B1 through B4) has a passenger boarding bridge (PBB) with the remaining two parking positions (gates A0.5 and B4.5) requiring ground-loading as hardstands. Gates A1 through A9 are in Concourse A on the southwest side of the terminal and Gates B1 through B4 are located in Concourse B on the northeast side. Though many airlines have current gate assignments, all gates are considered common use. The gates are currently distributed between the airlines as follows:

- American: Preferential use of three gates with PBBs and one hardstand
- Delta: Preferential use of three gates with PBBs and one hardstand
- Southwest: Preferential use of one gate with a PBB
- United: Preferential use of two gates and two shared use gates; all with PBBs

A diagram of the gate assignment is shown in **Figure 2-19**.

Figure 2-19: **Concourse and Gate Diagram**



Source: Greenville-Spartanburg International Airport Commission

2.4.2. General Aviation Facilities

General aviation (GA) facilities support both based and itinerant GA aircraft operations at GSP. Components of GA landside facilities include FBO facilities, aircraft hangars, apron areas, and automobile parking areas.

General aviation activity is made up of all aeronautical activity except for military and commercial service operations. GA users at GSP include individuals flying for business or personal reasons, maintenance, and charter. In 2015, 16 GA aircraft were based at the airport including five single-engine, four multi-engine and seven jet airplanes. Based aircraft are those aircraft that are parked and flown from an airport for the majority of the year. Further, each aircraft must have flown at least one hour during that year. Both based and itinerant GA users have full access to the FBO services provided by Cerulean Aviation. In 2016, GSP experienced a total of 8,708 general aviation operations.

General Aviation Terminal

In January of 2010, GSP opened a new general aviation terminal at the Airport located north of the commercial passenger terminal on the general aviation apron. This facility is approximately 6,700 square feet in size and supported by a 150-stall parking lot. The general aviation terminal is operated by Cerulean Aviation.

The GA terminal project was awarded a LEED-Gold Certificate by the U.S. Green Building Council as the building uses 38 percent less energy overall than similar sized buildings and approximately 75 percent less water because of a rain harvest system, which is used to collect rainwater from the roof for toilet flushing. In addition, a solar water heating system provides hot water and the building employs Variable Refrigerant Flow Technology for highly efficient heating and cooling. Multiple glass panels eliminate the use of electrical lights during daylight hours. During construction, 98 percent of the waste generated was recycled.

General Aviation Hangars

To support the general aviation terminal and the services provided by Cerulean Aviation, the Airport has multiple general aviation hangars. Each hangar has varying storage capacity and parking availability as shown in **Table 2-10**.

Table 2-10: GA Hangars

Designation (Location)	Leasee/Owner (Use)	Total Space (SF)	Parking Stalls
Hangar 1 (2100 GSP Drive)	PSA (Maintenance)	40,500	113
Hangar 2 (2102 GSP Drive)	Cerulean Aviation (Community Storage)	29,700	46
Hangar 3 (2106 GSP Drive)	SAI Flight Services (Storage)	13,200	77 (shared)
Hangar 4 (2108 GSP Drive)	Milliken Aviation (Storage)	16,200	77 (shared)
Hangar 5* (2110 GSP Drive)	Michelin (Storage)	21,200	-
Hangar 6* (2112 GSP Drive)	Venture Air (Storage)	33,790	-

*Note: * = under construction*

Source: Greenville-Spartanburg International Airport, 2017

2.4.3. Cargo Facilities

The Airport has two main cargo facilities, one located on the northern cargo apron and the other connected to the commercial/southern cargo apron as shown in Figure 2-15. The larger cargo center on airport property is on the main cargo apron area on the north side of the airfield and provides 120,000 square feet of indoor space for air cargo processing and logistics. This facility is in good condition, and capable of sorting up to 3,000 packages per hour. Additionally, the shipping center located in this area provides for dangerous goods and international shipping, express, and ground services. There is also a 5,000 square-foot cargo facility north of the large cargo center on the main cargo apron.

The remainder of cargo and freight activity is housed in a 52,250 square-foot building located on the south cargo area and accessed by GSP Drive. The building was recently renovated to include 30 docks. This space is shared by American Airlines Cargo, Delta Cargo, Southwest Cargo, Senator International Freight Forwarding Solutions, and Bradford Airport Logistics.

For cargo operators, equipment is available and able to be relocated to each of the cargo areas including:

- (2) Cargo loaders
- (8) Cargo and baggage tractors
- (96) Cargo dollies
- (3) Wide-body aircraft belt loaders
- (5) 4,000 to 5,000 lb. forklifts
- (2) 10,000 lb. forklifts
- (1) 20,000 lb. forklift
- (1) Ground Power Unit (GPU)
- (1) De-ice truck
- (1) Lavatory service cart
- (2) Wide-body aircraft pushback tractors
- (1) Narrow-body aircraft pushback tractor
- (3) Widebody aircraft stair trucks
- (1) Narrow-body aircraft stair truck
- (1) Aircraft tail stand

- (2) Light carts
- (2) Drive over scales (1 – 10', 1 – 20')

2.4.4. Airport Support Facilities

A variety of supporting infrastructure and equipment is employed at GSP to provide for safe, efficient and reliable aeronautical operations. Utilizing perimeter fencing and sophisticated access control technologies, GSP can protect critical airfield areas. The services provided via the on-site ARFF station and airfield maintenance facility ensure the Airport operates at the highest degree of safety, and the airport fuel-farm and deicing facilities ensure year-round operational reliability. The following sections will further discuss each of these facilities.

Security and Fencing

Airport security is provided by the GSP International Airport Police Department. The Airport Police Department has office space on the Apron Level of the Main Terminal and is staffed by 19 employees, 12 of which are officers.

GSP is fully enclosed by a perimeter fence of approximately 31,000 linear feet with secure entrance gates providing access to authorized personnel and vehicles to the airfield perimeter roads, aprons, taxiways, and runways. The entirety of the perimeter fence stands eight feet above the ground and is topped with three strands of barbed wire on outward tilted outriggers. There are 27 security gates providing vehicle access to airport properties as part of the perimeter fence. Of these, 12 are equipped with electronic access control card readers/cameras while the remainder are secured with lock and chain. Additionally, 10 pedestrian gates permit access through the fence. All pedestrian gates are equipped with electronic access control.

Aircraft Rescue and Fire Fighting (ARFF)

GSP's ARFF is located on the north end of the passenger service apron next to the ATCT where there is immediate access to Runway 4-22. The ARFF facility is operated by the GSP International Airport Fire Department and is considered an Index C facility. Federal Aviation Regulations (FAR) Part 139 regulations determine the ARFF index based upon air carrier aircraft length and number of daily departures. Index C facility and minimum equipment requirements defined in §139.317 require either:

- Three vehicles
    - One vehicle carrying the extinguishing agents:
        - 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or
        - 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application
    - Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 3,000 gallons.

- Two vehicles:
    - One vehicle carrying the extinguishing agents
        - 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production.
    - One vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons.

GSP ARFF equipment includes three ARFF trucks, one quick response ARFF truck, one custom pumper, one heavy rescue service truck, and one brush truck. This equipment is stored in the four-bay, 9,000 square-foot ARFF building which also provides for office and crew space for the 19 certified aircraft and rescue fire fighters which comprise the GSP International Airport Fire Department. In addition to ARFF services, the department provides for emergency medical system (EMS) first response, structural firefighting, hazardous material first response, confined space rescue, auto extrication, and fire safety inspections.

Airfield Maintenance

GSP's airfield maintenance facility complex is located southwest of the south cargo apron area. The complex occupies 9.18 acres of land to accommodate four buildings of approximately 12,800, 6,400, 5,040, and 1,080 square feet. The complex provides storage for the following maintenance vehicles and equipment:

- (1) Snow thrower
- (2) Snow pushers
- (12) Snow plows
- (2) Snow blowers
- (2) Oshkosh H Series snow units
- (4) Snow brooms
- (1) 1980 Ford 7000
- (1) 2004 Ford F740 Box Dump
- (1) 2004 Ford F750, 14' Bed Dump
- (1) T-1100 Pro Liquid De-Icer
- (1) 5.9 Yard Granulated Spreader
- (9) Mowers
- (3) Tractors
- (3) Sweepers
- (2) Runway closure markers

The maintenance facility complex also contains a 10,000-gallon diesel and a 10,000-gallon gasoline fuel tank. The complex is accessed from GSP Drive and is connected to the airfield by a single road leading to the south cargo ramp area. Both access roadways are gate controlled.

Fuel Farm

GSP operates a fueling facility through Cerulean Aviation located south of the airport maintenance facility. The farm contains four 30,000-gallon tanks of Jet A fuel and one 12,000-gallon tank of Avgas. All tanks have a 95 percent max capacity level with high level auto switch off controls at 95 percent and high-level alarms at 90 percent. All fuel trucks that refill at the storage facility have three separate high level shut off systems to prevent overfill including a Scully System. A fifth 30,000-gallon Jet-A tank is anticipated to be installed in the near future, bringing total Jet-A capacity to 150,000 gallons.

Deicing Facilities

De-icing and anti-icing services are offered for both general aviation and commercial aircraft operating out of GSP. Airfield maintenance facilities and the airfield's FBO provide the necessary supplies and equipment. Currently, GSP maintenance maintains a 6,100-gallon tank with aircraft deicing fluid. When needed, aircraft are deiced at their gate or hardstand.

2.4.5. Utility Infrastructure

The Airport's utilities infrastructure including electric, natural gas, water, telephone/cable, internet, and sewer were reviewed as part of this Master Plan and the following information was found to be relevant for the Airport. The location and system connections are displayed in **Figure 2-20**.

Electric Power

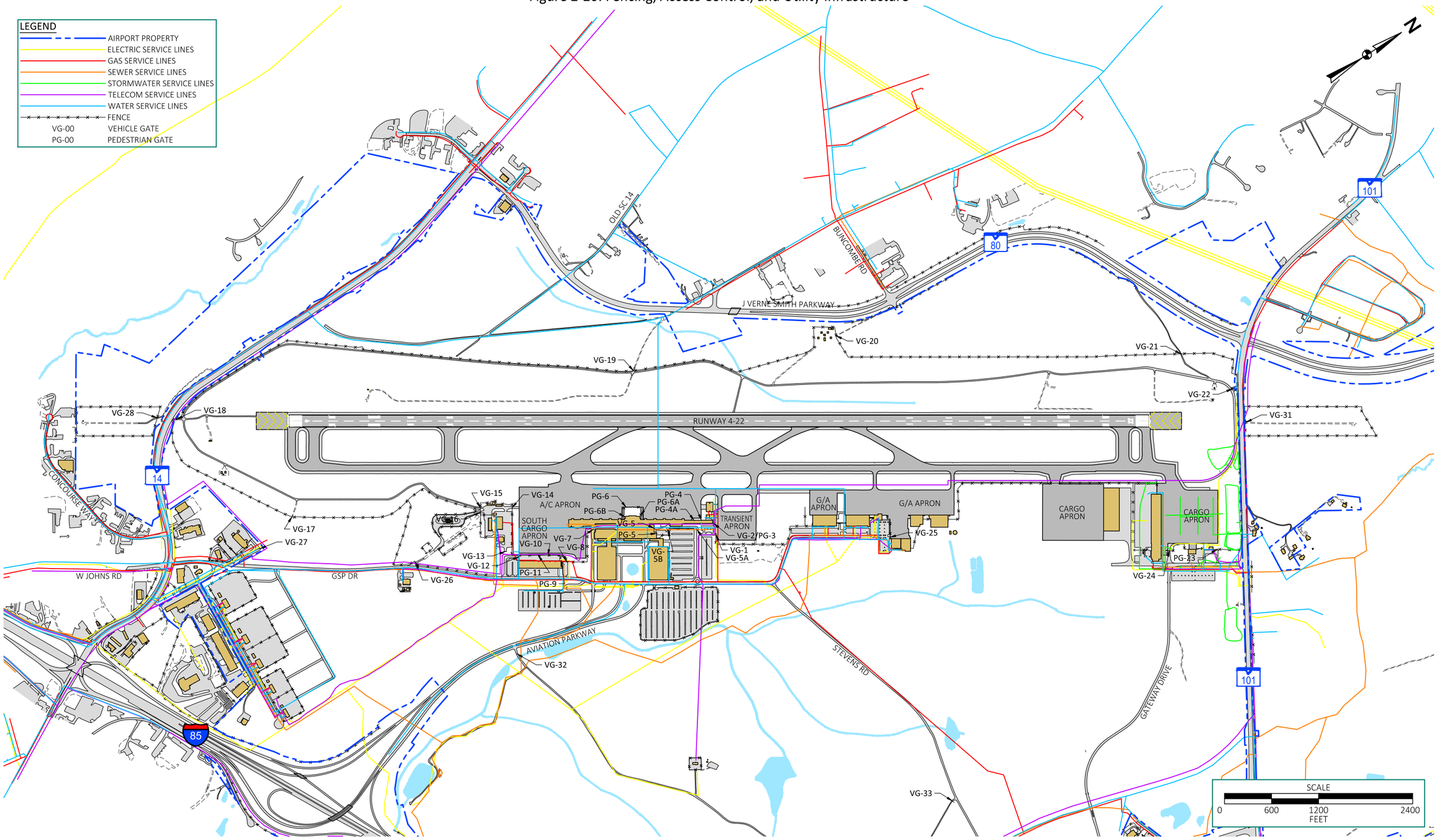
Normal electric power distribution is provided to GSP by Duke Energy with 24kV of electric services fed by the company's transformers. All current airport facilities feed off circuit #2406 from the Pelham Retail Substation which remains loaded at half capacity. Airport property west of Runway 4-22 is not currently equipped with any electric service.

Natural Gas

Natural gas is provided by the Greer Commission of Public Works (CPW) with gas lines entering airport property from Route 101, Stevens Road, and GSP Drive. Natural gas utility could be extended to currently unserved properties west of Runway 4-22 from locations along State Road 14, J. Verne Smith Parkway (SR-80) and South Buncombe Road.

Page intentionally left blank.

Figure 2-20: Fencing, Access Control, and Utility Infrastructure



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\EXISTING.dwg

Page intentionally left blank.

Sanitary Collection System

Sanitary and waste collection is provided by CPW to all structures on airport property. No Airport owned facilities utilize a septic system or leach field. While currently not equipped with sewer lines, properties west of Runway 4-22 could presumably tie in existing sewage lines along SR-14 or SR-80 in the future if needed. Future development of other Airport properties could be served be either CPW or Renewable Water Resources (REWA).

Stormwater Service System

The ability for an airport to quickly and efficiently move stormwater from its hard surfaces and safety areas is of critical importance to ensuring safe aeronautical operations and maximizing the lifespan of airport pavement. At GSP a variety of inlets, pipes and swales help to capture, direct, and disburse stormwater from its impervious services to include the airfield system, aircraft aprons, roadway and parking facilities.

Communication Lines

Airport facilities all have access to telecommunications infrastructure providing both telephone and high-speed internet.

Water System

Water is provided by CPW. Water lines access airport property from a number of locations east of Runway 4-22 along Aviation Parkway, GSP Drive, and Route 101, and from two locations west of Runway 4-22 from service points along Highway 80. One water line is located under Runway 4-22 near its mid-point.

2.4.6. Regional Access, Airport Parking and Ground Transportation

The following summarizes ground access, circulation, and automobile parking within GSP. Airport access, ground transportation and parking facilities are depicted in Figure 2-21.

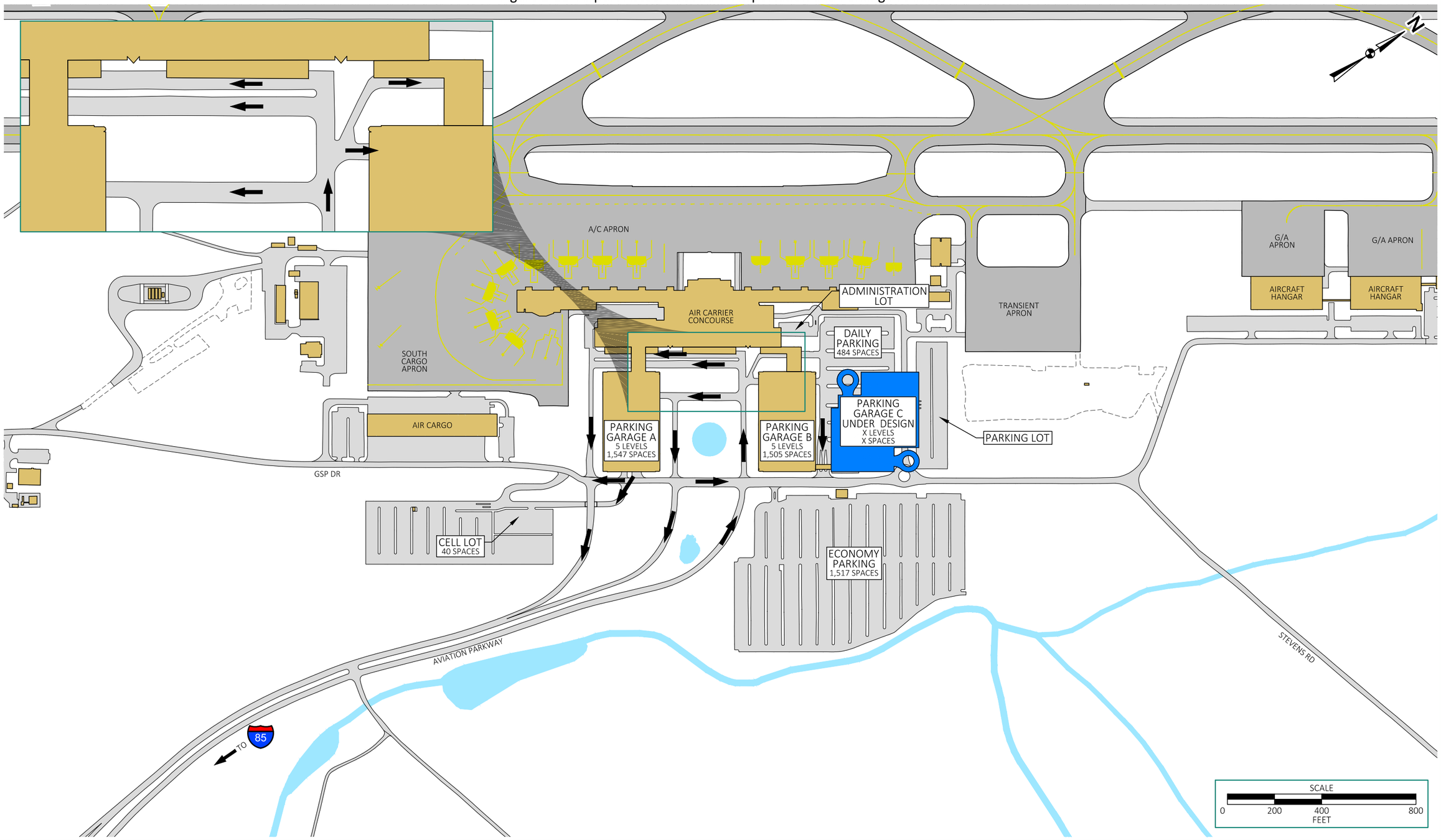
Roadways

GSP is located immediately northwest of Interstate 85 (I-85). I-85 runs southwest to northeast and is the primary arterial highway connecting Greenville and Spartanburg, and, more broadly, Atlanta and Charlotte. Both north and southbound I-85 traffic is connected to Aviation Parkway via Exit 57 which provides direct access to GSP drive and GSP's commercial terminal.

Aviation Parkway is a two-lane, two-way roadway that leads incoming traffic directly to the passenger terminal area and serves as the primary airport ingress/egress route. After incoming traffic is merged from I-85, Aviation Parkway leads traffic approximately one mile to the airport landside area and circulates counterclockwise through the terminal curbside. From there, Aviation Parkway follows the curbside loop and directs exiting traffic back towards I-85 parallel to its entrance route. As shown in Figure 2-21, GSP Drive intersects Aviation Parkway prior to the terminal curbside area to provide access to parking, offices, the FBO, and major tenant areas of the airport located in the surrounding area of the terminal.

Page intentionally left blank.

Figure 2-21: Airport Access Ground Transportation and Parking Facilities



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\EXISTING.dwg

Page intentionally left blank.

Since Aviation Parkway circulates counterclockwise to provide access back to I-85, there are two intersections of GSP Drive allowing reentrance to the loop if necessary.

In addition to providing access to facilities near the terminal, GSP Drive is the secondary entrance point into GSP and connects inbound traffic from SR-14, located on the west side of the airport running north to south. SR-14 provides a channel from Greer and crosses the SR-80 to the north as well as I-85 to the south of the airport. Tenants on the south side of the airport, including NWS and airline freight facilities, are accessible via this entrance and GSP Drive. Since GSP Drive runs parallel to Runway 4-22, it also provides airport and FAA employees access to the administrative facilities and general aviation users access to the FBO on the north side of the terminal. GSP Drive ends in the general aviation parking lot.

Additional area roadways connect traffic to the remaining airport and tenant facilities. Stevens Road is located towards the north end of GSP Drive and provides private access to tenants and airport personnel located on the northeast end of the airport. Stevens Road provides access from Brockman McClimon Road, which is located to the southeast of the airport connecting I-85 on its southern end and Route 101 to the north. For facilities on the north cargo apron, Gateway Drive provides direct access and leads to the parking areas located there. This one-lane, two-way road also directly connects operations on the northern cargo apron to the BMW manufacturing factory to the east of the airport. Prior to the factory, Gateway Drive intersects the larger New Woodruff Road (Route 101) at its north end and Brockman McClimon to the south; each of which channel traffic to I-85 and SR-80.

Traffic Circulation

Traffic circulation and congestion on the Airport roadways is greatly impacted by the departure and arrival schedules of flights. During times of peak activity, the terminal loop roadway and terminal curbside areas can experience significant demand. At GSP, the terminal loop roadway is defined by the circle created by Aviation Parkway and GSP drive. Aviation Parkway provides access to both parking garages and the Daily parking lot before becoming parallel with the Terminal building and splitting in two to provide both the traditional terminal frontage curb as well as a vehicular island curb. From the vehicular island curb a single pedestrian crosswalk exist to provide access to the terminal building, though it has been observed that pedestrians cross from the vehicular island curb to the terminal at all areas. Vehicles which occupy the portion of Aviation Parkway on the outside of the vehicular island curb have the option to exit to GSP Drive prior to reaching Parking Garage A or proceed the entire length of the terminal building before exiting the terminal area towards GSP Drive beyond Parking Garage A. Those vehicles which occupy the roadway on the inside of the vehicular island curb have only one egress route to GSP drive.

Rental car parking exit and car return entrances are located on the southeast side of Parking Garage A connected to GSP Drive. Departing cars have the option to take GSP Drive to exit the airport area or join circulating traffic on Aviation Parkway towards I-85.

As a major avenue for airport access, the traffic circulation on I-85 has a large impact on that of the airport roadway system. In 2012, the South Carolina Department of Transportation (SCDOT) conducted a Corridor Analysis of I-85 for the area connecting Greenville and Spartanburg counties. This segment of I-85 was identified by the SCDOT as a main priority for congestion relief of state highway systems. Three sections of this corridor provide access to the airport roadway system that result in delays for both departing and arriving traffic during peak times of congestion on I-85. The study forecasts the annual average daily traffic (AADT) volume for these areas to have a 1.8 percent growth rate for the next 10 to 15 years.

A Traffic Count Study was completed at specific locations on the Airport as part of the master planning effort. A full report of this study is included in Appendix B.

Parking

GSP parking facilities include short- and long-term lots, rental lots, a cell phone lot, economy and additional parking for Airport and tenant staff. All revenue producing parking areas are operated by Republic Parking System. A summary of parking lots and spaces is found in Table 2-11.

Parking Garage A and B

Parking Garages A and B are located across from the entrance to the terminal building, Garage A being the southernmost. Both garages provide access to the terminal building via ground level painted and covered crosswalks. The Garage A crosswalk crosses the terminal drop off road and the Garage B crosswalk crosses the access road to the daily parking lot.

Access to Parking Garage A is located on the southeast side of the terminal across from the arrival curb. Garage A provides 742 covered spaces and 324 Sky Lot spaces. Of those, 386 spaces on the first floor of Garage A are reserved for rental car ready/return activities. A total of 31 handicap spots are available in Garage A. The average occupancy rate of Garage A is 89 percent.

Access to Parking Garage B is located on the southwest side of the structure via Aviation Parkway. Parking Garage A has a rental car return entrance on its southeast side via GSP Drive. Garage B provides 1,182 covered spaces and 323 Sky Lot spaces. Garage B provides 34 designated handicap spaces. The average occupancy rate of Garage B is 83 percent.

The exit to the parking garages is controlled by a gate equipped with a payment booth. Parking garage rates are as follows: $1.00 for the first 30 minutes, and $1.00 for each additional hour with a $14.00 daily and a $98.00 weekly maximum. The Sky Lot parking rates are as follows: $1.00 for the first 30 minutes, and $1.00 for each additional hour with a $7.00 daily and a $49.00 weekly maximum.

Daily Parking

The Daily parking lot is located adjacent to and north of Parking Garage B. Daily parking has 484 spaces including 10 handicap spaces. This lot also has 117 spaces designated for valet parking only. Lot users enter via an access road connected to Aviation Parkway on the terminal side of the lot. Daily parking rates are as follows: $1.00 for the first 30 minutes, and $1.00 for each additional hour with a $9.00 daily and a $63.00 weekly maximum.

Economy Parking

Economy parking is located to the southeast of Parking Garage B and Daily Parking across GSP Drive. This lot has 1,522 spaces including 26 handicap spaces. Traffic enters the lot via GSP Drive on the lot's northeast. The parking rates are as follows: $0.00 hourly charge with a $5.00 daily and a $35.00 weekly maximum.

Overflow Parking

The development of an overflow parking lot adjacent to the existing cell phone lot is currently being designed and is programed for implementation in the near future. This lot will provide approximately 500 additional parking spaces during period of peak parking demand. This lot will be equipped with two bus shelters to support regular bus service between this lot and the terminal curb.

Cell Phone Lot

A cell phone lot is available for traffic waiting on passenger arrivals since curb-side parking/waiting in front of the terminal building is prohibited. The cell phone lot is located to the southeast of Parking Garage A across GSP Drive. The cell phone lot has 40 spaces and users enter via an access road connected to GSP Drive on the southeast side. This lot is open and freely available.

Employee Parking

On the north end of the terminal is a private lot for airport and tenant employees with 214 spots. The entrance to the lot is via an access road connected to GSP Drive. This lot is programed for a

small expansion in the near future. Parking lots are also available for FBO employees and users as well as airline freight tenants. Each of these lots is accessed through GSP Drive.

Table 2-11: Airport Parking Summary

Parking Area Location	Total Spaces	Designated Handicap Spaces
Parking Garage A	1,457	31
Parking Garage B	1,505	34
Daily Parking	484	10
Economy Parking	1,517	26
Cell Phone Lot	40	-
Employee Parking	214	-

Source: Greenville Spartanburg International Airport District, 2017

Rental Cars

Five rental car agencies provide services to passengers at GSP including Alamo/National, Avis, Budget, Enterprise, and Hertz. Each rental agency has business counters located in Parking Garage A. Alamo/National, Avis, and Enterprise are located on the first floor of Garage A and Budget and Hertz are on the second floor. An off-site rental agency, Thrifty/Dollar Car Rental, provides pickup services from their shared location to the south of the airport on SR-14.

Rental car agencies operating from GSP do so from rental car counters and admin space within the terminal baggage claim lobby, 386 ready/return spaces of Garage A, and independent but co-located quick turn-around (QTA) facilities south of the terminal complex off Service Center Road accessible via GSP Drive. Each of the five rental car companies also has a separate Quick-Turn-Around (QTA) facility located on Airport property at the juncture of GSP Drive, Airport Road, and Industrial Park Road. A QTA is a facility where the rental car company can re-fuel the vehicle, vacuum it, and wash it prior to entering the vehicle back into service. QTA facilities are also used for light maintenance on the vehicle, such as oil changes and tire changes. The area is also used for longer-term storage of vehicles before and after local events when greater demand for rental vehicles is anticipated. Altogether, approximately 16 acres have been constructed for the use of rental car QTA's. In addition, there is approximately 13 unpaved acres available for additional vehicle storage or future QTA expansion.

2.5. AIRPORT TENANTS

2.5.1. Cerulean Aviation

Cerulean provides FBO services at the Airport and is wholly owned by the GSP Airport District. Cerulean is focused on providing exceptional general aviation and commercial aviation services to Airport users. In addition to operating the general aviation terminal, Cerulean has six hangars which it leases as previously discussed.

Cerulean GA

Located on the general aviation apron, Cerulean GA provides a premier concierge experience to GA travelers. Cerulean operates a full-service FBO from the GA terminal building. The services available to general aviation users include:

- Jet A and 100LL fueling services
- Ground handling
- Deicing and anti-icing Types I and IV
- Freight handling services
- Aircraft on Ground (AOG) services, by third party
- Rental cars on-site

Cerulean Commercial

Cerulean Aviation's commercial division operates from 4:00AM to 11:00pm local time to provide passenger, cargo, and ramp services including:

- Jet-A refueling
- Deicing and anti-icing Types I and IV
- Ramp enplanement/deplanement for private charters
- Rental car delivery and return
- Ground Security Coordinator (GSC) services
- U.S. Customs and Immigration clearance
- Build and break cargo services
- Palletized and non-palletized load handling
- Truck loading, unloading and docks
- Container freight station (CFS) warehousing and storage
- Aircraft parking and cleaning
- Ground power access
- Air start service

2.5.2. Federal Aviation Administration

The FAA leases 1,098 square feet of office space adjacent to Gate B2 on the Apron Level of the terminal. This office provides facilities for the FAA Regional Administrator's field representatives and local coordinators.

2.5.3. National Weather Service – National Oceanic and Atmospheric Administration (NOAA)

A NWS-NOAA weather forecast office (WFO) is located on the southwest side of GSP property on GSP Drive. The facility consists of an office building of a little over 6,000 square feet, six utility buildings, and approximately 30 vehicle parking stalls. The buildings are in good condition. The facility is equipped with a Next Generation Radar (NEXRAD), a high-resolution S-band Doppler weather radar, to provide information and updates on local weather, forecasts, and warnings for airport users.

2.5.4. Cargo and Freight

Multiple facilities at the Airport provide opportunity for consolidation, shipment and forwarding for cargo and freight tenants. GSP cargo tenants include FedEx, American Airlines Cargo, Delta Cargo, Southwest Cargo, Senator International Freight Forwarding, and UPS.

FedEx operates out of the largest cargo center on airport property, located on the main cargo apron area on the north side of the airfield. UPS operates out of the newly constructed north cargo building. The southern cargo building is shared by American Airlines Cargo, Delta Cargo, Southwest Cargo, Senator International Freight Forwarding Solutions, and Bradford Airport Logistics.

Multiple local and international freight forwarding organizations support the cargo tenants at GSP. Forward Air Solutions and Benore Logistics Systems provide supply chain management resources to carriers at the facility. For cargo entering the terminal building, Bradford Airport Logistics offers security as well as command and control services for those goods entering the terminal complex.

2.5.5. Industrial Park Road Complex

GSP currently owns and leases out facilities located on Industrial Park Road in three buildings. Building A is located between Airport Road and Runion Road as shown in **Figure 2-22**. It has approximately 42,500 square feet and three tenants:

- RPM Transportation, leasing 20,000 square feet, is a local trucking company providing warehousing and logistic services.
- S&D Coffee, leasing 7,500 square feet, is a national supplier of coffee, iced tea, and extracts.
- Courier Express is leasing 15,000 square feet

Building B is situated between Industrial Park Road and Runion Road. It has approximately 20,000 square feet and is leased to Forward Air Inc.

Building C is situated between Industrial Park Road and Runion Road. It has approximately 39,500 square feet and six tenants:

- Jim Whitehead Tire: An automotive service and tire installation provider for commercial vehicles, currently leasing 10,000 square feet
- Expeditors: A global logistics company, leasing 5,000 square feet
- Jim Turf and Irrigation: Offers products for gold course maintenance, landscaping and lighting, leasing 7,500 square feet
- Color Channel: Provides sample kits and color channels for the mortar industry, leasing 1,154 square feet
- H&H Electrical: An electrical maintenance and service provider for commercial clients, leasing 1,346 square feet
- Runion Asset Management: A asset management provider, leasing 2,500 square feet.

Figure 2-22: Industrial Park Road Buildings

Source: Google Earth

2.6. AIRPORT LAND USE PATTERNS

GSP is sponsored by both Greenville and Spartanburg Counties in South Carolina. The land use area on and surrounding the airport, called the Airport Environs Area, was created for the protection and security of airport users and the surrounding community. A land use map is depicted in Figure 2-23.

2.6.1. Airport Area Land Use

The area surrounding GSP is mostly residential to the north- and southwest with some intermittent industrial and institutional land use to the direct west and the southeast. A small amount of commercial land is located to the southeast as well.

2.6.2. Airport Area Zoning

GSP zoning is under the authority of the Greenville-Spartanburg Airport Environs Commission (Commission) as granted by South Carolina Code Annotated § 55-11-230 (1995). This Commission has identified the airport zone as a unique Airport Environs Area as defined by this code:

- Airport Environs Area: "All property consisting of the area described in the Air Installation Compatible Use Zone pursuant to DODINST 4165.57 established by the United States Air Force applicable to runways 4L-22R (11,000 feet) and the proposed parallel runways 4R-22L (8,500 feet) including the CLEAR ZONES, ACCIDENT POTENTIAL ZONE I, and the ACCIDENT POTENTIAL ZONE II. Specifically, the environs includes all property 1,000 feet to each side of the runway centerlines and in a corridor 3,000 feet (1,500 feet either side of the runway centerlines) wide, extending from the runway thresholds along the extended runway centerlines for a distance of 15,000 feet, and shall include the property located between the two corridors; provided, however, that the southwestern boundary of the environs area shall be the middle of Rocky Creek."

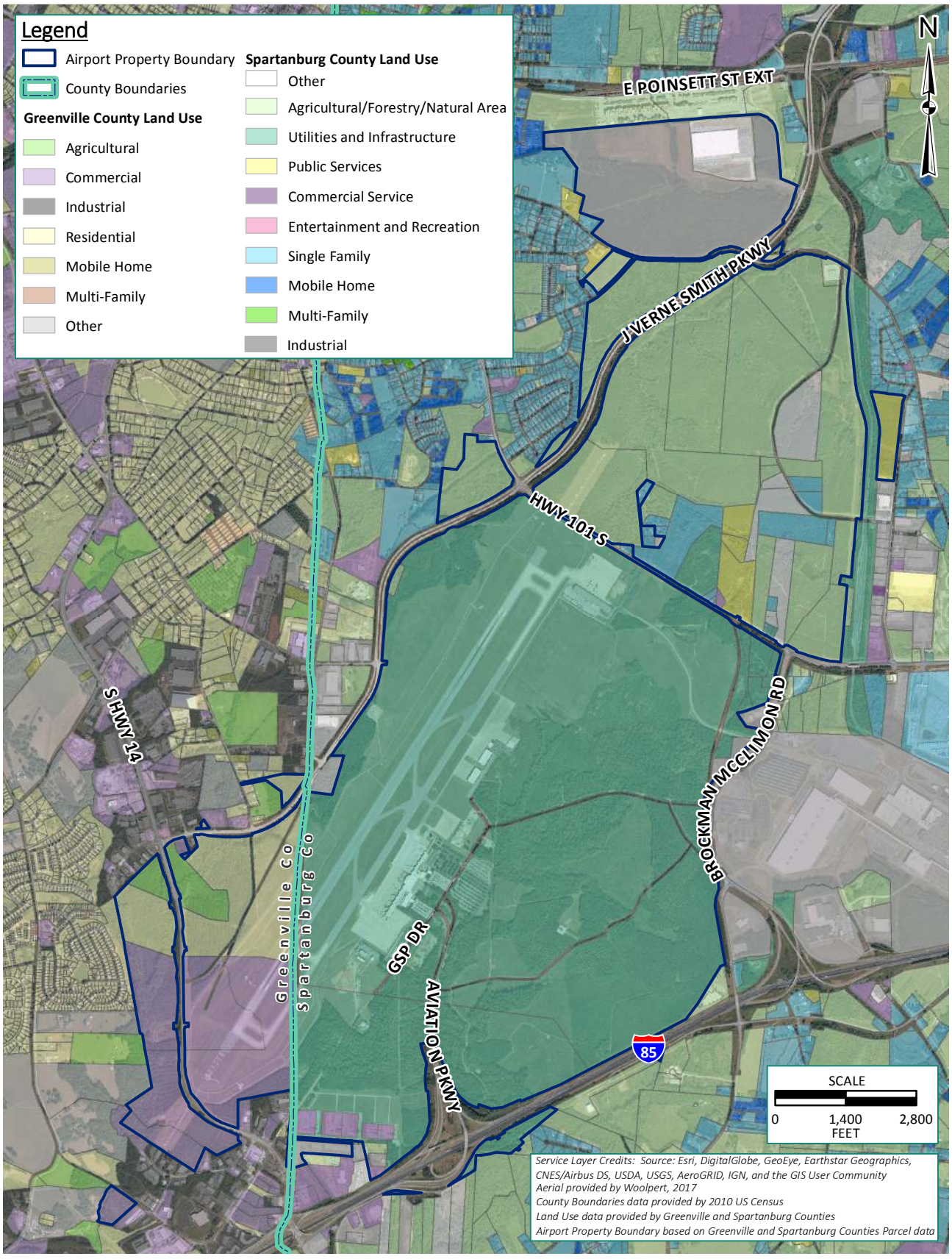
As shown in Figure 2-24, the majority of GSP lies in Spartanburg County with a large portion of development to the north of the airfield in the City of Greer. The areas outside of the Airport Environs Area within Spartanburg County include the following district groupings:

Downtown Urban Districts (D-T4, D-T5, D-T6): These zoning districts are intended for high concentrations of commercial and business uses targeting travelling customers.

Industrial District (I-1, I-2): These districts are intended for light and heavy manufacturing, assembly facilities, and warehouses.

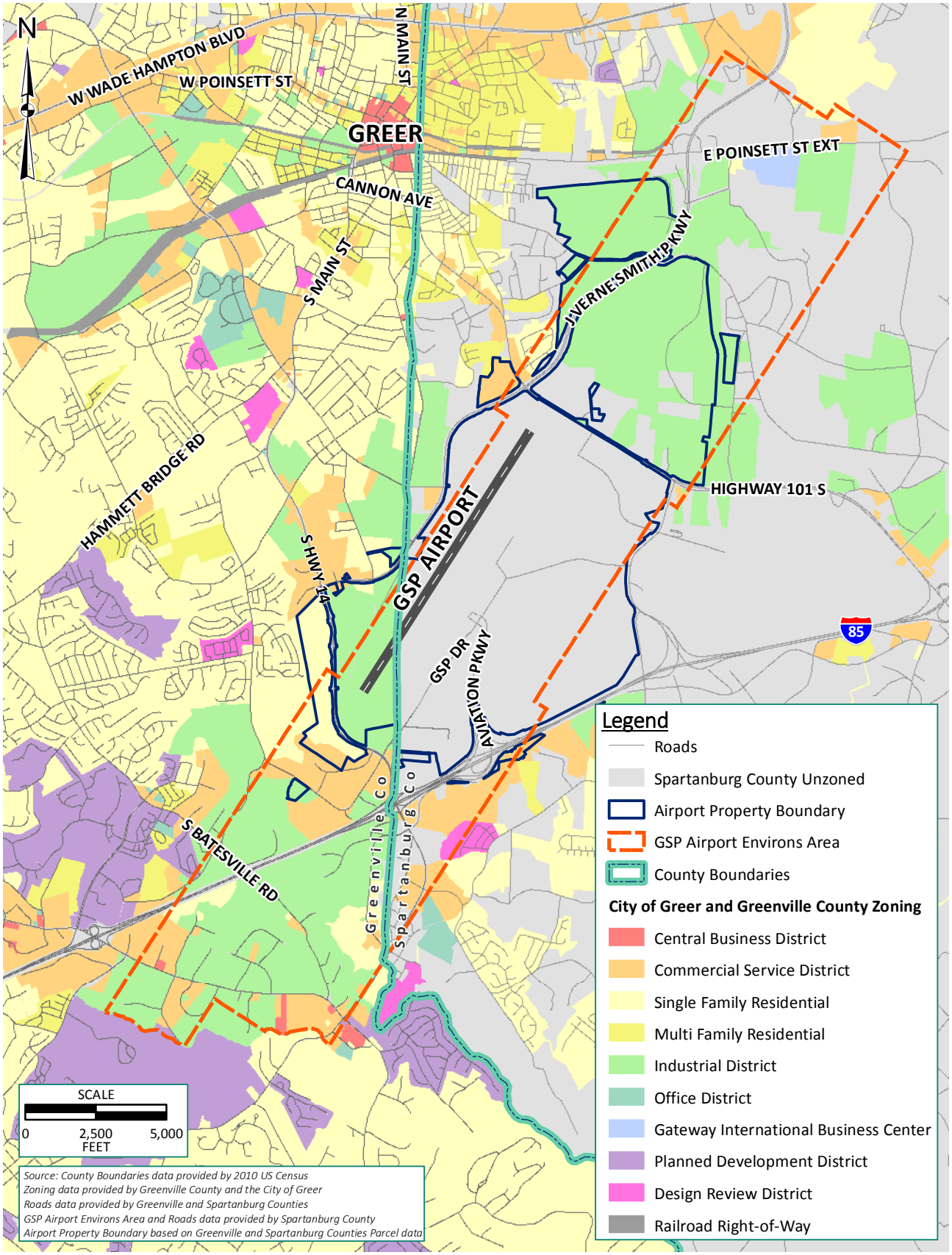
Residential District (R-6, R-8, R-12, R-15): These districts are intended for general and single-family dwellings and related recreational and support facilities.

Figure 2-23: Land Use Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\2-23 Land Use.mxd

Figure 2-24: Zoning Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\2-24 Zoning.mxd

The remaining western portion of the airport lies in Greenville County. The Airport Environs Area zoning designation is maintained in this county by the Greenville-Spartanburg Airport Environs Commission as well. The surrounding areas outside this area within Greenville County include the following zoning districts:

Central District (C-1): This zoning district is intended for areas of high business concentration and commercial uses located in the downtown area.

Commercial District (C-2, C-3, NC, S-1): This zoning district is intended for the development of commercial land uses and transitional areas to industrial districts.

Industrial District (I-1, PD-1): This district is intended for manufacturing, assembly facilities, and warehouses.

Residential District (R-5 to R-20A, R-S, DRD): These districts are intended for single family dwellings and related recreational and support facilities.

Multi-Family Residential District (R-M, TO R-M20, R-MA, R-MHP): This zoning district is intended for areas of medium to high population density for two- and multi-family dwellings as well as the recreational and support facilities related to them.

Planned Development District (PD-R): This district is established to encourage innovative and creative design of residential and/or commercial developments, to permit a greater amount of flexibility by removing some of the restrictions of conventional zoning.

Office District (O-D, POD): This zoning district is intended for research and office facilities for local use.

2.6.3. Airport Master Land Use and Development Plan

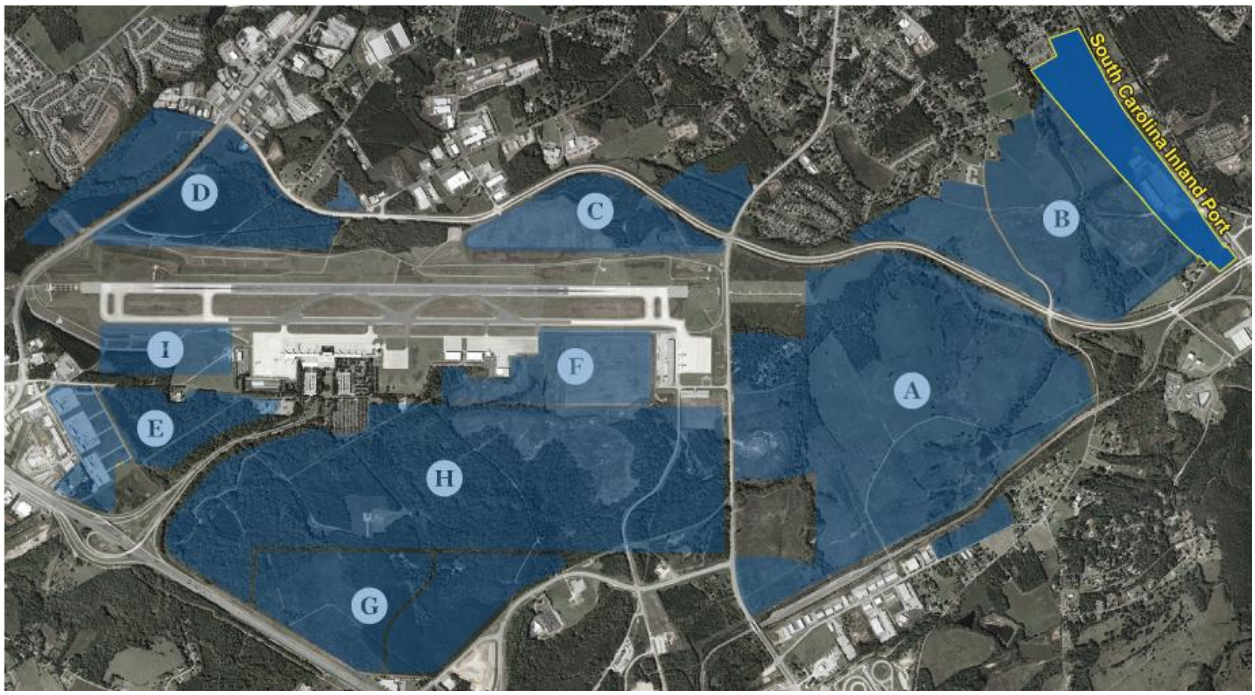
As discussed in Section 1.3.4 of this report, the Airport's master land use and development plan has been used since 2013 to encourage airport compatible development in and around Airport property in a way consistent with the District's strategic development initiatives. This plan, called GSP 360, identifies a total of nine tracts (Tracts A through I), the highest and best use for those tracts, anticipated phasing for future utilization and for some tracts detailed resource documents for potential investors. Table 2-12 details each of these development tracts and Figure 2-25 displays them graphically.

Table 2-12: Airport Master Land Use and Development Plan Tracts

Tract	Acres	Highest and Best Use
A	746	Industrial This would most likely consist of a mixture of larger footprint warehousing, distribution and manufacturing uses.
B	315	Logistics and Distribution This could include a mix of smaller service users fronting J. Verne Smith Parkway and larger footprint warehousing, distribution and manufacturing to the rear of the tract.
C	112	Aviation and Aviation Support Additionally, future light industrial and service uses are feasible along the roadway as topography and access allow.
D	229	Industrial and Service Additional potential for Retail, Office, Flex/R&D and Aviation components as well.
E	156	Flex/Research and Development Excellent potential for Office, Hospitality, Aviation-related, Industrial and Service components
F	82	Aviation and Aviation Support Tract F offers airside access and is well suited for future aviation expansion, including air cargo facilities.
G	250	Industrial, Flex/R&D, Retail and Hospitality Tract G's frontage along Brockman-McClimon Road is exceptionally well-suited to meet the needs of most users.
H	619	Recreational/Public and Industrial The land between Stevens Road and Route 101 has varied topography and strong physical characteristics that allow for a wide variety of development options.
I	69	Aviation and Aviation Support Offers airside access and the ability to accommodate future aviation expansion as demand warrants.

Source: GSP Master Land Use and Development Plan, 2013; GSP360beyondtherunway.com, 2017.

Figure 2-25: Airport Master Land Use and Development Plan Tracts



Source: GSP360beyondtherunway.com,2017.

As part of the airport master plan land use analysis, any potential impacts to development within the study area were evaluated. The South Carolina Inland Port (SCIP) was identified as a significant factor affecting off-airport development. Located on the north side of the Airport adjacent the GSP International Logistics Park, the port acts as an extension of the Port of Charleston to connect companies to the Southeast and South Carolina's Upstate region. The port operates shipping services via train and provides space for private trucking. In 2016, SCIP handled approximately two million twenty-foot equivalent units (TEUs). With a well-connected logistic system and high capacity, this port is considered a major asset for facilitating and developing land use areas in the airport logistics park and other non-aeronautical properties.

2.7. AIRPORT COMMUNITY SURVEYS

Digital surveys were developed and distributed to Airport users, tenants, and stakeholders as a means to inform this master plan and initiate a dialog with airport stakeholders. Appendix C provides a summary overview and individual responses for each of these surveys.

Some of the resulting recommendations and comments from the surveys/interviews were as follows:

- Tenant space allocation and location is satisfactory but updates within the facilities is desired by multiple tenant groups.
- Long range fuel contracts may be an opportunity for economic growth at the Airport.
- Airport community stakeholder groups value the Airport as an engine of local economic growth, credibility, and quality of life.
- Opportunities exist to expand hangar space offerings and other GA facilities.

2.8. CONCLUSION

The above descriptions do not provide an exhaustive account for every specific detail and facet of the Greenville-Spartanburg International Airport. The purpose of this inventory is to provide general facility data for subsequent analyses pertinent to this study effort. The following chapters of this report will seek to project future aeronautical demand which will then be compared to existing facility data for the purpose of analyzing future facility requirements and provide context for future facility improvement decision making.

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE
CHAPTER 3: AVIATION FORECASTS

McFarland Johnson

Table of Contents

Chapter 3 – Aviation Forecasts

3. Aviation Forecasts 3-1
3.1. Introduction 3-1
3.2. Forecast Influencing Factors 3-2
3.2.1. Service Area 3-2
3.2.2. Aviation Industry 3-2
3.3. Socioeconomic Trends 3-3
3.3.1. Population 3-4
3.3.2. Employment 3-5
3.3.3. Per Capita Personal Income 3-5
3.4. Passenger Enplanements 3-6
3.4.1. Historical Activity 3-6
3.4.2. Existing Forecasts 3-7
3.4.3. Forecast Methodologies 3-8
3.4.4. Air Service Analysis 3-9
3.4.5. Selected Forecast 3-14
3.4.6. Derivative Forecast Scenarios 3-14
3.4.7. Peak Hour Enplanements/Peaking Characteristics 3-15
3.5. Air Cargo 3-16
3.6. Aircraft Operations 3-18
3.6.1. Historical Activity 3-19
3.6.2. Growth Elements 3-20
3.6.3. Air Carrier and Air Taxi 3-21
3.6.4. General Aviation Operations 3-21
3.6.5. Military Operations 3-22
3.6.6. Aircraft Fleet Mix 3-22
3.6.7. Peaking Characteristics – Aircraft Operations 3-23
3.7. Based Aircraft 3-24
3.8. Forecast Summary 3-25
3.8.1. Comparison with FAA Terminal Area Forecast 3-25
3.9. Future Design Aircraft 3-26
3.10. Long Range Planning 3-27

List of Tables

Chapter 3 – Aviation Forecasts

Table 3-1 : Historical and Forecast Percentages of Growth in Population 3-4
Table 3-2 : Historical and Forecast Percentages of Total Employment 3-5
Table 3-3 : Historical and Forecast Total Percentages of PCPI 3-5
Table 3-4 : Historical Passenger Enplanements 3-7
Table 3-5 : Existing GSP Forecasts 3-8
Table 3-6 : Forecast Enplanements by Methodology 3-9
Table 3-7 : Historical Air Service Activity 3-11
Table 3-8 : Projected Air Service Activity 3-13
Table 3-9 : Baseline Enplanement Forecast 3-14
Table 3-10 : New Service Derivative Scenarios 3-15
Table 3-11 : Enhanced Aircraft Upgauging Scenario 3-15
Table 3-12 : Peak Enplanement Characteristics 3-16
Table 3-13 : Historical Cargo Demand 3-17
Table 3-14 : Forecast Air Cargo Activity 3-18
Table 3-15 : Historical Aircraft Operations 3-20
Table 3-16 : Annual Operations Forecast by Type 3-22
Table 3-17 : Aircraft Fleet Mix 3-23
Table 3-18 : Peak Hour Operations 3-24
Table 3-19 : Based Aircraft Forecast 3-25
Table 3-20 Aviation Demand Forecast Summary 3-25
Table 3-21 : Aviation Demand Forecast vs. FAA Terminal Area Forecast 3-26
Table 3-22 : FAA Airport Reference Code 3-27
Table 3-23 : Future Design Aircraft 3-27
Table 3-24 : Long Range Planning Forecast 3-27

List of Figures

Chapter 3 – Aviation Forecasts

Figure 3-1 : Historical Passenger Enplanements 3-6
Figure 3-2 : Historical Aircraft Operations 3-19

3. Aviation Forecasts

3.1. INTRODUCTION

The purpose of aviation forecasting is to outline future growth of significant areas of activity over a 20-year period at Greenville-Spartanburg International Airport (GSP or the Airport). The Federal Aviation Administration (FAA) requires that all airport planning efforts be based upon an approved forecast methodology as the resulting analysis assists in determining the facility requirements for meeting future demand.

The key elements of this chapter include:

- Forecast Influencing Factors
- Socioeconomic Trends
- Passenger Enplanements
- Air Cargo
- Aircraft Operations
- Based Aircraft
- Forecast Summary
- Future Design Aircraft
- Long Range Planning

Key metrics of the aviation forecasts and their focus at GSP include the following:

Annual Passenger Enplanements – The number of people boarding aircraft at GSP each year, which is used to identify the need for future passenger terminal area space, parking facilities, and airport access. In the dynamic commercial aviation industry forecasting passenger enplanements requires a broad view of trends and influencing factors as opposed to looking at past relationships through regression analysis. These growth-influencing factors range from socioeconomic patterns to air service analyses.

Aircraft Operations – The number of takeoffs and landings at GSP each year, which is used to determine the necessary capacity of the airfield and aircraft operating area. A takeoff and landing is each counted individually as one operation.

Based Aircraft by Type – The number and type of general aviation aircraft maintained at the airport on a permanent basis, which is used to identify the space requirements of future facilities.

Air Cargo Activity – The weight, in pounds, of air freight and air express shipments to/from GSP annually, which is used to determine the size of future cargo facilities.

General Aviation Operations – The estimated number of general aviation takeoffs and landings at GSP, which used to determine the necessary capacity of the airfield and GA support facilities.

The forecast efforts will carefully consider the uses and applications for which the forecast demand will be applied. An emphasis has been placed on activity indicators that drive facility planning such as peak hour enplanements, air cargo and general aviation demand.

3.2. FORECAST INFLUENCING FACTORS

The forecast analysis for the GSP master plan reflects a snapshot in time based on historical trends and industry data from the year 2017. Influencing factors presented in this section identify considerations and areas of uncertainty that provide additional context for the GSP forecast. Changing variables and guaranteed uncertainty are underlying reason for the dynamic master plan approach which includes the scenario based forecasts and Dynamic Analysis Tool that combine to enhance the utility of the forecast as the industry evolves.

3.2.1. Service Area

As defined in Chapter 2 – *Inventory*, the Airport Service Area (ASA) encompasses all areas within a 60-minute drive of GSP. The Airport is the only commercial service airport within the ASA with Asheville Regional (AVL), Charlotte/Douglas International (CLT), and Hartsfield – Jackson Atlanta International Airport over an hour drive away. Several general aviation (GA) airports are located near GSP that act as both reliever and public use airports.

The general aviation service area is generally defined as a 30 nautical miles (nm) ring centered on GSP. There are four airports within this area of which GSP is the sole commercial service airport. Two of the four airports have ILS services and Donaldson Field Airport (GHY) provides the next largest runway in the area at 8,000 feet.

For both commercial and general aviation, changes in facilities or activity at other airports in the service area have the potential to affect demand and activity levels at GSP both positively and negatively.

Considerations for the local economy are based on existing conditions and past performance. Analysis and speculation regarding possible future economic performance is not part of this master plan. However, any significant future changes in the local economic performance, for better or for worse, would warrant a cursory review of the forecast inputs and assumptions.

3.2.2. Aviation Industry

The airline industry is evolving rapidly to maintain sustained profitability as the economy continues to improve. There have been a number of airline mergers reducing overall system capacity and affecting individual market competition. These mergers have created more efficient airlines with increased load factors and profits, primarily resulting from reduced competition and unbundled products driving new ancillary revenues for things such as checked baggage and seat assignments.

The decreases in fuel price across the country have also facilitated record profits for most US airlines in 2015. As of August 2017, this trend has plateaued and airlines may be susceptible to the pressure of rising fuel costs once again. Recovery of the economy has led to steady increases in leisure and business travel while the airlines have continued slow growth in seating capacity. The net result between the economy, airline mergers and the growth of ancillary services and fees is fewer flight options nationwide, moderately higher ticket costs to the passengers, and stronger

airline profits. The bulk of the traffic growth has been occurring at large-hub airports where competition is at its greatest.

Some specific aviation industry influencers include:

Pilot Supply – In recent years the industry has begun to see impacts associated with a reduced number of pilots entering the aviation industry. Reduced pay, with the onset of regional jet flying in the 2000's, and regulatory changes requiring 1500 hours for first officers have added to an already increasingly expensive training process. These are compounding factors that will likely increase the severity of this issue in the coming years. Some industry groups also predict a similar shortage in qualified aircraft mechanics as well. Limited pilot supply is a contributing factor to the recent aircraft upgauging trend.

NextGen – For the past 10 years, the FAA has been incrementally implementing new technology with the broader goal of modernizing the nation's air traffic control system. Some of the key objectives involve improving the safety and efficiency of airspace in and around high-volume airport regions such as Atlanta, New York and Washington. These improvements may not have a noticeable impact on GSP's operational efficiency; however, it may reduce delays to hub airports and provide the opportunity for additional schedule frequencies resulting in an improved passenger experience.

Fuel Prices – Over the past 10 years the aviation industry has demonstrated its sensitivity to fuel prices and their impact on operational cost and ultimately aviation demand. On average, fuel represents approximately one-third of the cost of commercial aviation activity. Thus, during spikes in fuel prices like in 2008, the impacts to both supply and demand are tremendous. Advancements in fuel technology will help reduce industry sensitivity to fuel although it will likely continue to be a key influencer for activity for some time.

Aircraft Technology – Over the past 20 years there have been significant advances and innovations to aviation and aircraft technology. With global positioning system (GPS) technology, unmanned aerial systems (UAS) and single pilot operations for complex aircraft systems, the next 20 years will likely yield numerous additional advances in technology that could impact various airline business models. Monitoring and maintaining an awareness of technology enhancements and potential applications for GSP will help ensure the airport is always well-positioned to respond to a changing industry.

3.3. SOCIOECONOMIC TRENDS

This section presents social and economic factors to better understand how each, either separately or in combination with other factors, relates to and influences aviation activity. Key indicators such as population, employment, and personal income per capita were analyzed for areas identified as significant for aviation forecasting. The United States, the Southeastern United States, The State of South Carolina (SC), the GSP Catchment Area, the Greenville-Spartanburg-Anderson Economic Area, the Greenville-Spartanburg-Anderson, SC Combined Statistical Area (CSA) and The Counties of Greenville and Spartanburg were each examined as part of this forecast and are defined as follows:

- *United States of America:* United States of America

- *Southeast*: The States of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia
- *South Carolina*: The State of South Carolina
- *The GSP Catchment Area*: The Counties of Buncombe, Burke, Cherokee, Clay, Cleveland, Graham, Haywood, Henderson, Jackson, McDowell, Macon, Madison, Mitchell, Polk, Rutherford, Swain, Transylvania, and Yancy in North Carolina, as well as Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, McCormick, Newberry, Oconee, Pickens, Richland, Saluda, Spartanburg, and Union Counties in South Carolina
- *The Economic Area*: Polk County, NC and Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, McCormick, Oconee, Pickens, Spartanburg, and Union Counties, SC as defined by the Bureau of Economic Analysis, 2007
- *CSA*: Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, Oconee, Pickens, Spartanburg, and Union Counties, SC
- *Greenville, SC*: The County of Greenville, SC
- *Spartanburg, SC*: The County of Spartanburg, SC

3.3.1. Population

Population is often a strong indicator of the potential for activity and growth at an airport as the higher the population growth, the more likely growth in operations and enplanements at an airport will be more stable. Population in the Southeast United States is forecast to increase more rapidly than the U.S. average over the next 25 years. The groupings of this and various other geographic sectors are shown in Table 3-1.

Table 3-1: Historical and Forecast Percentages of Growth in Population

Year Range	United States	SE	South Carolina	GSP Catchment Area	Economic Area	CSA	Greenville County	Spartanburg County
1969-2015	1.02%	1.40%	1.41%	1.19%	1.26%	1.27%	1.61%	1.20%
2016-2041	0.87%	1.07%	1.16%	0.81%	0.85%	0.88%	1.21%	0.77%

Note: SE = Southeast

Source: Woods and Poole Economics, 2017

Greenville County population growth outpaced the other sectors between the years 1969 and 2015 with an average annual growth rate of 1.61 percent. The State of Carolina came in second with an average annual growth rate of 1.41 percent, followed closely by the Southeast with 1.40 percent. The United States Population experienced the slowest average annual rate of growth of all the sectors analyzed, with an average annual growth rate (AAGR) of 1.02 percent.

The rate of growth over all the areas is anticipated to be less within the next 25 years than it previously was. Greenville County is expected to have a higher rate of average annual growth, at 1.21 percent, than all the sectors examined. South Carolina and the Southeast are also expected to continue to outperform the national average with 1.16 and 1.07 percent AAGR respectively.

3.3.2. Employment

Between the years of 1969 and 2015, Greenville County outperformed every other sector with an average annual growth rate in employment of 2.28 percent AAGR. This was followed by the Southeast sector with 1.94 percent AAGR and South Carolina with 1.78 percent AAGR as shown in Table 3-2. The sector with the lowest average annual rate of growth was the GSP Catchment Area at 1.54 percent AAGR, which was only marginally better than Spartanburg County with 1.55 percent AAGR in employment.

Although periodic business cycles, such as the 2008-2009 recession, have interrupted and changed the growth trajectory, the nation's employment is generally expected to rise over the next 25 years with steady job gains. The rate of growth between 2016 and 2041 is predicted to be less than that of the previous 46 years, but it is anticipated to be steady. Greenville County is forecast to continue to lead the sectors with 1.46 percent AAGR. South Carolina is projected to follow with 1.4 percent AAGR and the Southeast with 1.34 percent AAGR. The lowest performing sector is anticipated to be Spartanburg County with 1.08 percent AAGR for employment.

Table 3-2: Historical and Forecast Percentages of Total Employment

Year Range	United States	SE	South Carolina	GSP Catchment Area	Economic Area	CSA	Greenville County	Spartanburg County
1969-2015	1.61%	1.94%	1.78%	1.54%	1.60%	1.61%	2.28%	1.55%
2016-2041	1.22%	1.34%	1.40%	1.13%	1.17%	1.17%	1.46%	1.08%

Note: SE = Southeast
Source: Woods and Poole Economics, 2017

3.3.3. Per Capita Personal Income

Per capita personal income (PCPI) has also been found to be a good indicator of potential growth at an airport, as increases in income can yield a greater ability and desire to travel among the population within the area. The percentages of average annual growth in PCPI are shown for each of the sectors in Table 3-3.

Table 3-3: Historical and Forecast Total Percentages of PCPI

Year Range	United States	SE	South Carolina	GSP Catchment Area	Economic Area	CSA	Greenville County	Spartanburg County
1969-2015	5.59%	5.77%	5.83%	5.71%	5.64%	5.69%	5.74%	5.75%
2016-2041	4.45%	4.50%	4.56%	4.39%	4.33%	4.37%	4.37%	4.35%

Note: SE = Southeast
Source: Woods and Poole Economics, 2017

The average annual rate of growth for per capita personal income, in current dollars, were higher than those for population and employment and more closely grouped both historically and in the forecasts. Between the years 1969 and 2015, the highest rate of growth for per capita personal income was experienced by South Carolina with 5.83 percent AAGR. This was followed by the Southeast with 5.77 percent AAGR and Spartanburg County with 5.74 percent AAGR. Greenville

came in at a close fourth with 5.74 percent AAGR. The lowest average annual rate of growth in per capita personal income was experienced by the United States with an average annual rate of growth for personal income per capita of 5.59 percent AAGR.

The highest performing sector for average annual growth rate for per capita personal income between the years 2016 and 2041 is predicted to be South Carolina at 4.56 percent AAGR. The Southeast and the United States are forecast to be second and third of those sectors studied with 4.50 and 4.45 percent AAGR respectively. The sector forecast to have the lowest average annual rate of growth in per capita personal income between the years 2016 and 2014 is the Economic Area with an average of 4.33 percent AAGR growth in personal income per capita.

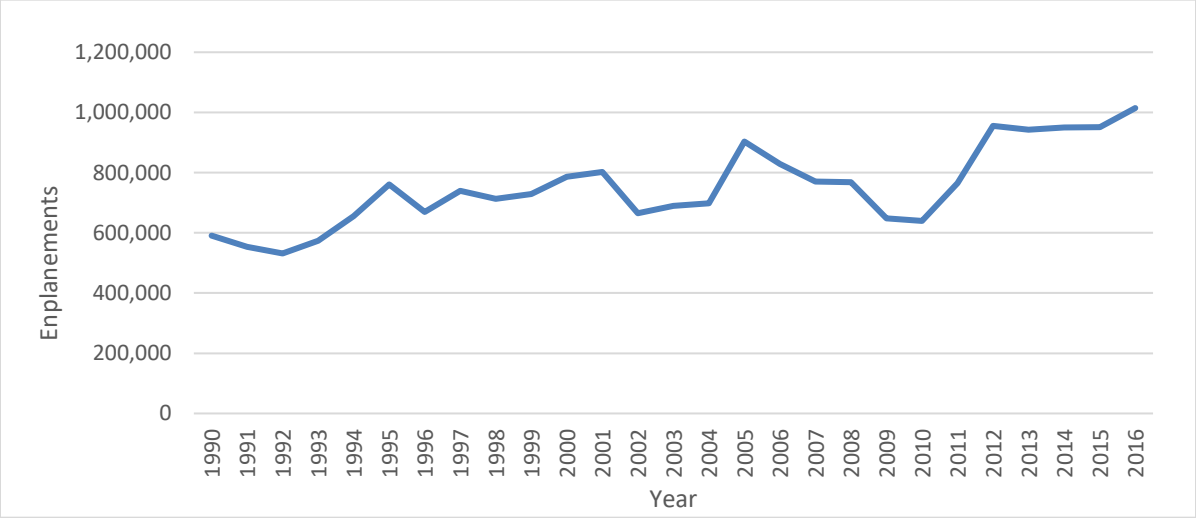
3.4. PASSENGER ENPLANEMENTS

Passenger enplanements are a key measure in the forecasting efforts for commercial service airports. The enplanements forecast focuses on the total annual enplanements as well as the peak hour characteristics of busier traffic periods. The results of these forecasts are particularly useful in the assessment of the passenger terminal building and associated facilities such as auto parking lots. Beyond that, the types and quantities of growth extend beyond the terminal area itself to impact elements such as roadways and transportation networks, helping to ensure that they are adequately sized for future demand.

3.4.1. Historical Activity

The historical data for passenger enplanements presented in **Figure 3-1** and **Table 3-4** depicts stable and consistent growth, not only over the past 10 years, but also over the past 25 years. This consistent growth in the shadow of growing airline hubs, three recessions, 9/11 and three airline mergers is a testament to the resilience of the overall GSP market.

Figure 3-1: Historical Passenger Enplanements



Source: GSP Airport Records, 2017

Table 3-4: Historical Passenger Enplanements

Year	Passenger Enplanements
1990	590,279
1991	554,026
1992	531,593
1993	573,878
1994	655,135
1995	760,918
1996	669,825
1997	739,584
1998	712,733
1999	728,735
2000	786,087
2001	802,132
2002	665,458
2003	690,038
2004	697,698
2005	903,503
2006	828,639
2007	770,406
2008	768,162
2009	648,657
2010	639,646
2011	764,626
2012	955,821
2013	942,465
2014	950,205
2015	951,148
2016	1,014,485
2017	1,074,508

Source: GSP Airport Records, 2017

3.4.2. Existing Forecasts

Several forecasts of activity already exist and were reviewed as part of the preliminary forecast efforts.

FAA TAF – The FAA Terminal Area Forecast (TAF) is a high-level forecast developed by FAA headquarters using macro-level inputs of national and regional data with the airport specific forecast being the result of broad-based forecast applications. While generally understood not to be a detailed reflection of local market demand, the TAF is considered by the FAA to be the basis from which a detailed forecast will be measured. The FAA TAF depicts a compound annual growth rate (CAGR) of 1.46% for GSP between 2016 and 2037.

FAA Aerospace Forecast – The National Aerospace Forecast is issued annually by the FAA and contains guidance on a variety of industry segments, including passenger traffic. This forecast projects a 1.7 percent CAGR for air carrier passengers identified in the 2017-2037 FAA Aerospace Forecast.

2010 Terminal Area Study – The forecasts developed as part of the *2010 GSP Terminal Area Study* were extrapolated to coincide with the forecast horizons for the master plan. Both the baseline forecast and low cost carrier (LCC) scenarios were extrapolated; it should be noted that the LCC scenario assumes nine flights via Southwest in 2017, compared to the current level of three.

The existing GSP forecasts are displayed in Table 3-5.

Table 3-5: Existing GSP Forecasts

Year	TAF	FAA Aerospace	2010 Terminal Study Base	2010 Terminal Study LCC
Existing (2016)	990,512	1,014,610	763,800	873,200
2022	1,077,708	1,122,600	831,800	1,202,002
2027	1,163,109	1,221,320	940,600	1,466,400
2037	1,348,414	1,445,570	1,213,600	1,902,000
CAGR	1.48%	1.70%	2.55%	2.74%

Source: FAA.gov, August 2017, GSP Terminal Area Study, October 2010

3.4.3. Forecast Methodologies

In addition to existing forecasts, several methodologies were explored to create additional forecasts for consideration using socioeconomic adjustments, service area dynamics and historical growth rates.

Population Adjusted Aerospace Forecast – The economic area for GSP has outperformed national average growth rates for population growth by approximately 24 percent. This forecast adds 24 percent to the aerospace forecasts growth rate for a CAGR of 2.61 percent.

Peer Airport Growth – One methodology included a review of airports similar to GSP and their historical performance and associated TAF forecasts. The analysis looked at airports with similar enplanement levels to GSP that were also within a two-hour drive of a large hub airport. Airports identified include; Birmingham, AL, Grand Rapids, MI, Harrisburg, PA and Lexington, KY. Of these airports, only Grand Rapids had higher historical growth in the 10 and 25-year periods with GSP outperforming the rest of its peers. The TAF however, identifies higher growth rates for each of the peer airports projecting GSP to underperform despite the strong track record for historical growth that GSP has experienced.

The peer average growth rate for these airports identified in the TAF is 1.91 percent CAGR; this methodology continues the overage in which GSP has outperformed peer airports relative to the peer group average TAF forecast resulting in a projected growth rate of approximately 2.26 percent CAGR.

Market Share – The market share forecast methodology considered GSP's position in the regional airport market relative to Asheville (AVL) and Columbia (CAE). Atlanta and Charlotte were excluded from the analysis as the passenger volumes at both of the large airports would dwarf the region thereby eliminating any statistical observations. GSP's market share is currently approximately 50.95 percent relative to AVL and CAE, increasing at a rate of 1.2 percent CAGR. The base growth for the combined three airport region uses the 1.7 percent CAGR from the FAA Aerospace Forecast. The effective resulting growth rate is 1.63 percent CAGR for GSP.

Population Adjusted Market Share – The population adjusted market share is similar to the previous market share methodology however, it contains a socioeconomic adjustment for population as the broader region outperforms national trends for population growth. The effective resulting growth rate is 2.58 percent CAGR for GSP.

Historical 25 Year Growth – This forecast methodology uses the 25-year historical compounded annual growth rate (CAGR) for GSP of 2.0 percent CAGR. This growth rate accounts for the effects of 9/11, three economic recessions and multiple airline mergers.

Post 9/11 Growth – This forecast methodology uses the post 9/11 historical CAGR for GSP of 2.78 percent CAGR. This growth rate accounts for the post 9/11 recession, the great recession of 2008-2010 and multiple airline mergers.

The resulting methodologies contain 2037 enplanement levels ranging from 1,423,577 to 1,805,596 with growth rates ranging from 1.63 percent CAGR to 2.78 percent CAGR as displayed in Table 3-6. These various methodologies are also consistent with the existing forecast ranges identified in the previous section.

Table 3-6: Forecast Enplanements by Methodology

	Pop. Adj. FAA Aerospace	Peer TAF Airport Growth	Adj. TAF Peer Airport Forecast	Market Share	Pop. Adj. Mkt. Shr.	Historical 25 yr.	Historical Post 9/11
Existing	1,014,610	1,014,610	1,014,610	1,014,619	1,014,610	1,014,610	1,014,610
2022	1,184,233	1,123,925	1,160,203	1,105,520	1,176,471	1,142,616	1,196,054
2027	1,347,056	1,223,965	1,297,367	1,202,739	1,338,227	1,261,540	1,371,810
2037	1,742,941	1,451,552	1,622,261	1,423,577	1,731,517	1,537,810	1,804,596
CAGR	2.61%	1.72%	2.26%	1.63%	2.58%	2.00%	2.78%

Source: McFarland Johnson Analysis, 2017

3.4.4. Air Service Analysis

Following a review of the previous forecast methodologies that involved various growth rates, an independent analysis was conducted regarding historical and projected scheduled air service levels to further inform the enplanements forecast. For this analysis, schedule data was analyzed for a peak day (Thursday) during the peak month (August) for 2007, 2012 and 2017. These peak characteristics were normalized to reflect an annual number (peaking characteristics are detailed later in the chapter).

Several industry trends were prominent in the review of air service changes over the past 10 years at GSP:

Airline and Hub Consolidation – In 2007, GSP was served by each of the major legacy carriers of the time including Continental, Northwest, and US Airways, each of which have since been acquired. As a result of these mergers, several airline hubs have been eliminated or scaled down, with the subsequent effect of GSP no longer having service to cities like Cincinnati, Cleveland and Memphis.

Low Cost Airline Growth – Low cost and less than daily service was still in its infancy in 2007 when GSP had twice-weekly service on Allegiant to two destinations in Florida. Service has since grown to additional destinations with weekly frequencies, a trend noticeable at many airports comparable to GSP. The previous 10 years has also seen the introduction of service by Southwest Airlines. Southwest expanded to several markets comparable to GSP, both organically, and also as result of their acquisition of AirTran Airways. The historical airline schedules also clearly show Southwest's shift from a network of focus cities to larger concentrations similar to that of a network airline hub, while not operating as such (no time-coordinated connections).

Aircraft Upgauging – From 2007 to 2017, GSP had nearly 18 percent fewer average scheduled daily departures while transporting over 35 percent more passengers. Industry wide, and especially at small and medium sized airports, regional jets and turboprops with 50 seats or less are being consolidated into larger regional aircraft. In most cases, these larger aircraft come at the expense of frequency. GSP markets that have benefitted from the larger aircraft are primarily the larger, busier airports such as Atlanta, Charlotte, Chicago and Dallas.

Historical scheduled air service activity is detailed in Table 3-7.

Table 3-7: Historical Air Service Activity

Airline	Destination	2007		2012		2017	
		Peak Daily	Seats	Peak Daily	Seats	Peak Daily	Seats
American	CLT	8	387	8	374	8	478
(US)	DFW	4	200	3	150	3	228
	ORD	3	150			3	150
	DCA	3	150	3	150	2	139
	PHL*	3	150	3	150	4	200
	LGA	2	100				
	TOTAL	23	1137	17	824	20	1195
Delta	ATL	8	610	10	818	8	1013
(NW)	DTW	3	150	4	200	4	245
	CVG	5	224	1	50		
	NYC*	2	100	2	100	2	145
	MCO	1	50				
	MEM	3	150				
	TOTAL	22	1284	17	1168	14	1403
Southwest	ATL					3	429
	BWI			2	274		
	MDW			2	280		
	HOU			1	137		
	BNA			1	137		
	MCO			1	143		
	TOTAL			7	971	3	429
United	EWR*	3	150	3	150	3	150
(CO)	IAH	3	137	2	100	1	50
	IAD	3	150	3	150	3	150
	CLE	2	100	1	50		
	ORD	3	150	3	150	4	252
	TOTAL	14	687	12	600	11	602
Allegiant	SFB	0.3	45	0.3	45	0.3	53.1
(AVG DLY)	PIE	0.3	45	0.3	45	0.3	53.1
	PGD			0.15	22.5	0.15	26.55
	FLL			0.3	45	0.3	53.1
	TOTAL	0.6	90	1.05	157.5	1.05	185.85
GSP TOTAL		59.6	3198	54.05	3720.5	49.05	3814.85
Monthly Seats		1,755	94,181	1,592	109,569	1,445	112,347
Monthly Enplanements (9.5% of Annual)			72,519		89,846		99,989
Annual TOTAL Enplanements		18,476	763,363	16,756	945,751	15,206	1,052,517

Source: GSP Airport Records, McFarland Johnson Analysis, 2017

Industry trend applications used in the future air service analysis include:

New Airlines and Routes – Industry consolidation has reduced the number of airlines in the domestic market, as a result GSP is served by each of the major network carriers, one low-cost carrier and one ultra-low-cost carrier (ULCC). The timing of introduction of service cannot be predicted and therefore the introduction of a new airline was excluded from this analysis, however derivative forecast scenarios will consider new entrant airline service.

Long-term it is anticipated that congested airports in New York (EWR/LGA/JFK) and Philadelphia will not see additional frequencies, with growth coming from the use of larger aircraft. While no new hubs are anticipated, there are several existing hubs and focus cities that could theoretically be supported from GSP later in the planning period such as Boston, Denver, and Miami, each of which are included in the air service enplanement analysis.

International service is not considered in the air service analysis though it is included in a derivative forecast scenario.

Low Cost Airline Growth – Current trends for LCCs and ULCCs are expected to continue, with additional destinations and weekly frequencies for ULCC service and new service to large focus cities for Southwest such as Baltimore, Houston and Orlando.

Aircraft Upgauging – Similar to the service patterns at GSP from 2007 to 2017, it is anticipated that the remaining 50-seat regional jets will be replaced by larger two-class regional jets in addition to some mainline aircraft on multiple frequencies. The air service model identifies Charlotte, Chicago and New York as having the most notable aircraft upgauges over the 20-year planning horizon.

This independent, air service based methodology produced forecast enplanements generally consistent with the previously identified methods, being slightly greater with a 2037 enplanement level of 1,870,165 and a growth rate of 3.15 percent CAGR.

Projected scheduled air service activity used in the air service forecast methodology is detailed in Table 3-8.

Table 3-8: Projected Air Service Activity

Airline	Destination	2022		2027		2037	
		Peak Daily	Daily Seats	Peak Daily	Daily Seats	Peak Daily	Daily Seats
American	CLT	7	532	7	588	7	700
(US)	DFW	2	264	3	340	3	368
	ORD	3	228	3	228	3	284
	DCA	2	152	2	152	3	228
	PHL*	3	228	3	228	3	284
	MIA	1	50	1	76	1	76
	TOTAL	18	1454	19	1612	20	1940
Delta	ATL	8	1192	8	1280	8	1280
(NW)	DTW	4	304	4	338	4	372
	NYC*	2	152	2	186	2	220
	BOS			1	76	1	76
	TOTAL	14	1648	15	1880	15	1948
Southwest	ATL	4	572	4	572	4	572
	BWI	2	286	2	286	2	286
	HOU					1	143
	MCO			1	143	1	143
	TOTAL	6	858	7	1001	8	1144
United	EWR*	3	176	3	228	3	284
(CO)	IAH	1	76	2	152	3	228
	IAD	2	100	2	100	2	152
	ORD	4	252	4	304	4	304
	DEN					1	76
	TOTAL	10	604	11	784	13	1044
Allegiant	SFB	0.4	70.8	0.4	70.8	0.5	88.5
(AVG DLY)	PIE	0.4	70.8	0.4	70.8	0.4	70.8
	PGD	0.3	53.1	0.4	70.8	0.4	70.8
	FLL	0.3	53.1	0.3	53.1	0.4	70.8
	VPS	0.3	53.1	0.3	53.1	0.3	53.1
	LAS			0.3	53.1	0.3	53.1
	TOTAL	1.7	300.9	2.1	371.7	2.3	407.1
Other (New or Incumbent)							
	TOTAL	2	110	3	186	5	220
GSP TOTAL		51.7	4974.9	57.1	5834.7	63.3	6703.1
Monthly Seats		1,523	146,511	1,682	171,832	1,864	197,406
Monthly Enplanements (90% Load Factor)			130,395		154,649		177,666
Annual TOTAL Deps/Enpl.		16,027	1,372,575	17,701	1,627,881	19,623	1,870,165

Source: GSP Airport Records, McFarland Johnson Analysis, 2017

3.4.5. Selected Forecast

The resilience of the GSP passenger market is demonstrated when comparing historical growth and socioeconomic characteristics. The market has demonstrated consistent growth in the face of strong expansion at large competitive environments at Atlanta and Charlotte, industry changing events such as 9/11, and a reduction in service by Southwest Airlines. Historically GSP has outperformed not only regional market airports and peer airports, but also national averages. The FAA TAF projects under-performance in each of these categories and as such was not selected for use in this master plan.

The sustained growth, socioeconomic-outperformance, and region-leading air service all comprise the key factors that will drive long term growth at GSP. The selected enplanement forecast for GSP is a blended average of all of the previously mentioned enplanement forecasts with a CAGR of 2.46 percent. While the air service scenario was not individually selected, it is anticipated that many of the assumptions and considerations will also be true in the selected baseline master plan forecast. Selected forecast enplanement levels are displayed in Table 3-9.

Table 3-9: Baseline Enplanement Forecast

Year	Enplanements
Existing (2016)	1,014,611
2022	1,182,700
2027	1,333,823
2037	1,648,052
CAGR	2.46%

Source: McFarland Johnson, September 2017

3.4.6. Derivative Forecast Scenarios

The following sections outline additional derivative forecasts scenarios that have been developed to address potential market conditions that are reasonably foreseeable but not able to be specifically quantified based on service announcements or contracts. These forecast scenarios will be additive or subtractive to the selected baseline forecast and will be used for facility planning only.

New ULCC Service – Compared to network airlines or even LCCs, the ULCC model favors less than daily service and varying schedules. This scenario considers the introduction of a new ULCC providing an average of 10-weekly frequencies to multiple destinations on aircraft in the 150 to 175 seat range. An additional weekly frequency is added in each subsequent year of the forecast for this scenario.

New LCC Service – Unlike the various schedules of the ULCC model, the LCC model tends to favor large focus cities as opposed to point-to-point or hub-and-spoke models. This scenario considers the introduction of new LCC service to one or two large focus cities with an average of three daily departures on aircraft in the 100 to 120 seat range.

New International Service – Many medium sized airports such as Buffalo, Columbus and Providence have seen the introduction of international service over the past several years and there is potential opportunity for this trend to continue for small-hub airports such as GSP. This scenario will consider the demand and facility impacts associated with the introduction of twice weekly international service to markets such as Cancun on aircraft in the 150 to 175 seat range.

Table 3-10 displays the additional service levels of the three derivative scenarios associated with new service at GSP.

Table 3-10: New Service Derivative Scenarios

Year	New ULCC		New LCC		New International	
	Operations	Enplanements	Operations	Enplanements	Operations	Enplanements
1	1,040	74,880	1,976	83,980	104	7,488
5	1,456	104,832	2,080	89,838	208	14,976
10	1,976	142,272	2,184	97,738	260	18,720
20	3,016	217,152	2,288	115,684	312	22,464

Source: McFarland Johnson, 2017

Market Interruption – While long term growth is anticipated for GSP, there is a potential for a temporary market interruption due to factors unrelated to the local GSP passenger market. Examples of a market interruption include airline network changes (loss of service or bankruptcy), enhanced low-fare competition at CLT, or a 9/11-like national event. This scenario includes a 10 percent drop in passenger demand/traffic with a 5-year recovery period (2 percent annually).

The enumerative value of this impact (10%) would be directly related to the respective year in which the affect would take place.

Enhanced Aircraft Upgauging – While the general trend of aircraft upgauging is contained in the general assumptions of the selected baseline forecast, this scenario will consider upgauging above anticipated levels and the impacts associated with larger aircraft and reduced frequencies. This scenario displayed in Table 3-11 maintains the forecast level of enplanements, however at reduced frequencies due to larger aircraft.

Table 3-11: Enhanced Aircraft Upgauging Scenario

Year	Change in Annual Operations
1	0
5	-2,000
10	-4,000
20	-10,000

Source: McFarland Johnson, 2017

3.4.7. Peak Hour Enplanements/Peaking Characteristics

When divided equally over the year and throughout the day, annual enplanement numbers will not accurately identify specific facility needs. To accurately identify airport requirements for facility planning, peaking characteristics are broken down into the following elements:

Peak Month – The GSP passenger market is more balanced on an annual basis compared to similar sized airports. Between peak summer travel, fall leaf season, holidays and spring break, there are no dramatic peaks in activity. Airport records indicate that August is the most above average period with approximately 9.5 percent of the annual total enplanements (equal distribution equates to 8.3 percent).

Average Day Peak Month – The average day of the peak month (ADPM) is the industry standard measure used in planning and analyzing an airport's peaking characteristics. In the case of GSP, August is the peak month, with July and October also being above average, therefore the peak month activity is divided by 31 days.

Peak Hour – Peak hour enplanements is the critical metric when planning for passenger terminal facilities. At small and medium sized airports, the peak hour is typically associated with the morning originating activity. Flight schedule data indicates that the peak hour for GSP is around the 6 o'clock hour in the morning and represents up to 20 percent of the daily departing seats. Adjacent hours of 5am and 7am are also busy. A normal distribution of a 14-hour day (accounting for single direction of activity) is just over seven percent meaning the 20 percent peak hour for GSP reflects a notable peaking characteristic to be applied when addressing facility requirements.

Peak enplanement characteristics for GSP are displayed in **Table 3-12**.

Table 3-12: Peak Enplanement Characteristics

	Existing	2022	2027	2037
Enplanements	1,014,611	1,182,700	1,333,823	1,648,052
Peak Month	96,388	112,356	126,713	156,565
Average Day Peak Month	3,109	3,624	4,088	5,050
Peak Hour	622	725	818	1,010

Source: McFarland Johnson, 2017

3.5. AIR CARGO

While enplanements, operations and based aircraft are typically viewed as the key forecast metrics for an airport, for GSP, air cargo is another important forecast metric. The FAA TAF does not have a provision for air cargo for comparison. This forecast considers all-cargo carrier activity only and does not include airline belly cargo activity.

Air cargo activity can be measured in two forms:

Landed Weight – Landed weight includes both the freight/cargo as well as the weight of the aircraft itself. The FAA uses landed weight when reporting statistics for all-cargo carriers.

Pounds/Tonnage – Most airports report cargo activity in either pounds or tonnage for mail/express/freight (some report each category separately). This activity is reported as both enplaned and deplaned activity and the aircraft weight is not included in these totals.

The cargo forecast for GSP uses the total (both directions) weight for combined cargo activities (mail/express/freight) in pounds.

The network cargo carriers (UPS and FedEx) have regional processing facilities (cargo equivalent of a focus city) at nearby airports with a FedEx facility at Greensboro (GSO) and a UPS facility at Columbia (CAE). As a result, the majority of GSP cargo involves mail/express/freight destined for or originating from the local Greenville/Spartanburg area. The amount of cargo activity at GSP, despite these processing facilities at other airports, underscores the strength of the local market for air cargo.

Historical demand for air cargo has been strong with a growth rate at nearly four times the national average over the past five years. Historical landed weight and overall pounds for GSP along with growth rates is displayed in Table 3-13.

Table 3-13: Historical Cargo Demand

Year	Landed Weight	Pounds
2002	154,923,100	41,806,000
2003	146,468,200	41,747,017
2004	151,162,700	45,720,706
2005	158,942,800	45,989,732
2006	158,795,700	52,274,546
2007	165,788,304	55,414,531
2008	169,776,120	51,966,318
2009	133,654,250	38,507,819
2010	152,218,275	48,654,867
2011	191,294,860	52,991,146
2012	203,367,812	54,607,566
2013	213,414,150	56,761,250
2014	249,117,397	58,574,065
2015	222,392,195	56,575,883
2016	247,817,497	63,807,773
2017E		89,999,195
5 yr. (2012-2016)	5.07%	3.97%
10 yr. (2007-2016)	4.57%	1.58%
15 yr. (2002-2016)	3.41%	3.07%

Note: E = Estimated

Source: GSP Airport Records, 2017

The current year statistics do not include the full resulting activity associated with the introduction of scheduled service by Senator Logistics Freight Forwarding, LLC (Senator), which is estimated to add over 26,000,000 pounds to the annual totals with potential for some additional service in the near term. Growth for 2017 and 2018 is expected to significantly exceed historical rates.

The methodologies reviewed for air cargo include the following:

Historical Growth Trends – Historical growth rates for the five, 10 and 15-year time periods were used to project future activity levels. Both the five and 15-year trends are over three percent which is over three times national averages for the same period. The 10-year growth rate is lower as this

period includes the Great Recession of 2008-2009, which had a significant impact on air cargo activities nationwide.

FAA Aerospace Forecast – The FAA Aerospace Forecast contains guidance for air cargo in the form of Revenue Ton Miles (RTM) projections for both domestic and international cargo. While RTMs are not the metric used in this forecast or by the Airport, the growth rate is still applicable for use. The FAA Aerospace Forecast identifies a growth rate of 1.7 percent for domestic, and 3.2 percent for international. At GSP, all of the Senator activity is between GSP and Germany and is not reflected in the historical growth rates as the service commenced in late 2016.

The FAA Aerospace Forecast applications used in this master plan include a blend of the domestic and international rates with a growth rate of 2.45 percent CAGR and also a scenario that adjusts the domestic growth for GSP's performance against the national average with an effective growth rate of 4.58 percent CAGR. A third FAA Aerospace Forecast scenario is a blend of both methodologies which is the selected air cargo forecast used as the baseline analysis for this master plan. Forecast air cargo activity (bi-directional pounds) is displayed in Table 3-14.

Table 3-14: Forecast Air Cargo Activity

Year	Historical 5 yr	Historical 10 yr	Historical 15 yr	FAA Aero RTM	FAA Aero Adjusted	FAA Aero Blend (Selected)
2016	63,807,773	63,807,773	63,807,773	63,807,773	63,807,773	63,807,773
2022	109,339,943	97,337,383	104,688,748	101,577,715	112,585,332	107,081,523
2027	132,837,002	105,273,899	121,775,910	114,645,827	140,839,670	127,742,749
2037	196,064,743	123,141,034	164,772,278	146,042,036	220,399,891	183,220,963
CAGR	5.49%	3.18%	4.62%	4.02%	6.08%	5.15%

Source: GSP Airport Records, FAA Aerospace Forecast, McFarland Johnson Analysis, 2017

While the growth rates are higher than the recent historical averages, it is important to note that they include the recent 26,000,000 pounds in additional activity associated with Senator and do not include speculative expansion proposals for the near term.

3.6. AIRCRAFT OPERATIONS

The FAA defines an aircraft operation as a takeoff or a landing and categorizes the operations by aircraft type and purpose. These categories include commercial (all airline operations at the passenger terminal), general aviation (both recreational and corporate), and military. The forecasting of these operations by category is used in the planning of terminal buildings, runways, taxiways and other airport infrastructure.

Growth elements affecting operations at GSP are expected to generally follow national trends related to aviation fleets. The growth rates used in the most recent FAA National Aerospace Forecast for 2017-2037 result in an operational forecast that is in close proximity to the FAA TAF. The air carrier operations totals (discussed later in this section) were also compared to the previously discussed air service scenario, with which it was highly consistent. Based on these strong consistencies with existing forecasts and independent methodologies, this master plan will use the TAF for the selected aircraft operations forecast.

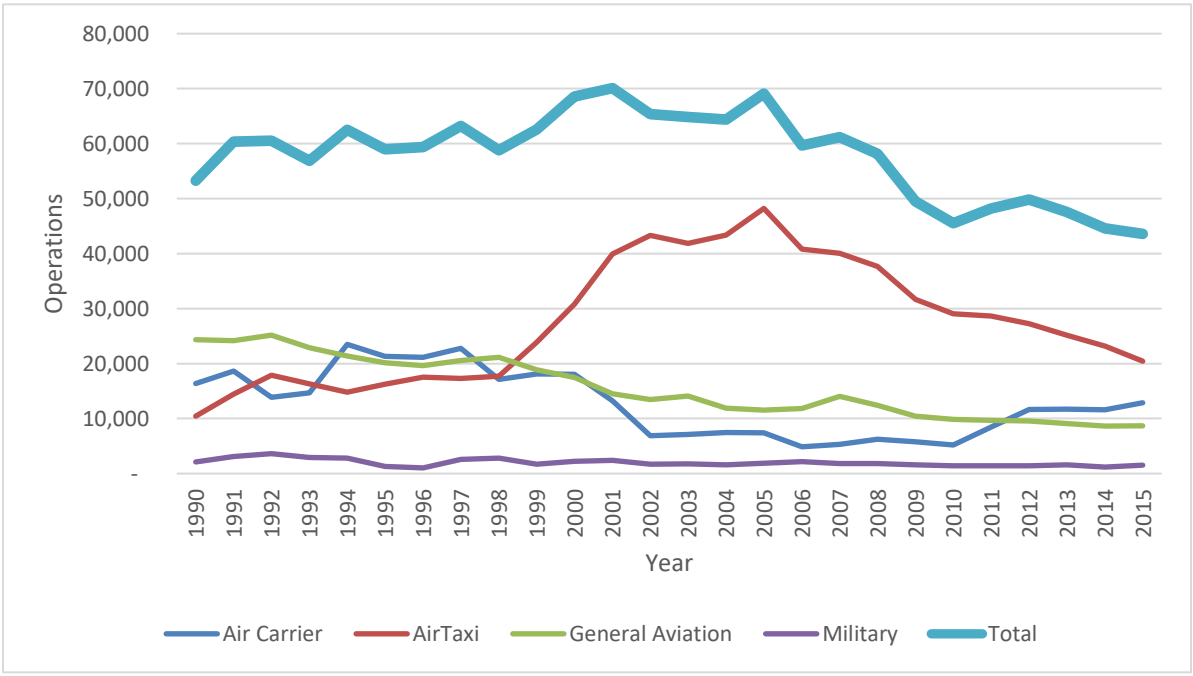
Growth in the total number of aircraft operations over the 20-year forecast period is approximately 1.23 percent CAGR.

Total general aviation operations are projected to increase at an average annual rate of 0.31 percent CAGR during the forecast period. Air taxi operations are projected to decrease at a negative average annual rate of 5.98 percent CAGR. The growth elements discussed for each operation type below include both local and airline industry factors that could impact aircraft operations at GSP.

3.6.1. Historical Activity

The historical data for aircraft operations, shown in **Figure 3-2** and **Table 3-15**, depicts trends for each operational type. Air carrier operations have fluctuated in the last 25 years with the initial growth of air service followed by a reduction in airlines at GSP. However, in the last 10 years, air service operations have slowly increased year over year. Air taxi operations peaked in 2005 at 48,221 and have followed a steady negative trend since. Total general aviation operations have seen a consistent decline historically, with both local and itinerant operations following negative trends, and military operations have remained consistently low over the last 25 years. Overall, the decline in total operations that has been seen historically has plateaued in recent years, with positive trends on the forecast horizon.

Figure 3-2: Historical Aircraft Operations



Source: FAA TAF, 2017

Table 3-15: Historical Aircraft Operations

Year	Air Carrier	Air Taxi	General Aviation	Military	Total
1990	16,356	10,440	24,357	2,100	53,253
1991	18,647	14,432	24,192	3,117	60,388
1992	13,868	17,899	25,172	3,622	60,561
1993	14,686	16,337	22,893	2,939	56,855
1994	23,497	14,809	21,398	2,822	62,526
1995	21,330	16,231	20,141	1,276	58,978
1996	21,164	17,532	19,644	1,031	59,371
1997	22,784	17,284	20,571	2,570	63,209
1998	17,136	17,682	21,157	2,838	58,813
1999	18,145	23,866	18,872	1,694	62,577
2000	18,076	30,783	17,469	2,213	68,541
2001	13,221	39,939	14,525	2,407	70,092
2002	6,902	43,309	13,469	1,709	65,389
2003	7,130	41,862	14,081	1,753	64,826
2004	7,455	43,379	11,914	1,611	64,359
2005	7,410	48,221	11,545	1,909	69,085
2006	4,868	40,810	11,829	2,162	59,669
2007	5,311	40,055	14,035	1,801	61,202
2008	6,248	37,689	12,389	1,834	58,160
2009	5,761	31,674	10,439	1,592	49,466
2010	5,187	29,067	9,862	1,398	45,514
2011	8,460	28,646	9,686	1,418	48,210
2012	11,636	27,260	9,537	1,402	49,835
2013	11,742	25,159	9,073	1,609	47,583
2014	11,599	23,197	8,633	1,176	44,605
2015	12,892	20,440	8,708	1,544	43,584

Source: FAA TAF, 2017

3.6.2. Growth Elements

Air Carrier/Taxi – Industry consolidation has reduced the number of airlines and hubs resulting in fewer nonstop routes than what were once available in the market. New airlines and new markets could be introduced over time, however the timing of introduction of service cannot be predicted and therefore the introduction of a new airline was excluded from this analysis. However, derivative forecast scenarios will consider activity from new airlines.

Trends for LCCs and ULCCs are expected to continue into the future, with additional destinations and weekly frequencies for ULCC service and new service to large focus cities for Southwest such as Baltimore, Houston and Orlando.

Similar to the service patterns at GSP from 2007 to 2017, it is anticipated that the remaining 50-seat regional jets will be replaced by larger two-class regional jets in addition to some mainline

aircraft used to replace multiple frequencies. Larger aircraft in place of greater frequency will maintain or even boost enplanements however it will slow overall operational growth.

General Aviation – At the time of this analysis, the airport has recently become the owner and operator of the FBO at the airport. For many years, general aviation has been only a minor presence on the airfield and with the new management structure, the overall goal is to enhance the general aviation presence at GSP. Presently there are only several months of data which are not sufficient in number to analyze and formulate reliable trends. A review of general aviation activity at GSP relative to industry trends should occur at a later time once multiple years of data are available. The facility requirements and alternatives chapters of this master plan will identify and reserve facilities for enhanced general aviation growth based on GSP's mission and goals for FBO growth.

Military – The growth of military operations is largely dependent on the security interests of the nation. Military aircraft are constantly relocated throughout the aviation system. Threats to the United States and disaster relief efforts may impact the amount of military operations at and around the Airport.

3.6.3. Air Carrier and Air Taxi

Air Carrier operations are those conducted by aircraft with 60 or greater passenger seats. Air Taxi operations include regional and commuter activity and commercial applications within general aviation such as Part 135 charter activity. Historically, the air taxi category has made facility planning difficult because it includes both airline and general aviation operations, however with the rapid retirement in 50-seat regional jet and smaller, nearly all airline operations in future years will be classified as air carrier. This transition between the two categories is reflected in the FAA TAF. As a result, the remaining Air Taxi operations will be considered as part of general aviation in facility planning.

Before endorsing the TAF operations forecast for the master plan, the air carrier operations were compared with the air service forecast methodology presented previously. The air service scenario depicts approximately 39,246 airline operations, while the TAF depicts 41,066 by 2037, a difference of 1,820 which equates to less than three departures per day.

3.6.4. General Aviation Operations

Annual itinerant aircraft operations, those flights originating or terminating 50 miles or greater from GSP, declined by 14.89 percent annually between 2011 and 2016. Itinerant GA operations are forecasted to slightly increase over the next 20 years. Though GSP's historic trend of GA itinerant operations has followed a negative growth rate, 2017 marked a return to positive growth, increasing operations of this type by 0.32 percent CAGR. It is expected from this point forward that itinerant GA operations at GSP will grow in line with the national forecast outlined in the TAF.

Defined as operations originating or terminating within 50 miles of GSP including traffic pattern operation, local GA activity has seen variations in growth over the last 10 years. Local GA operations at GSP are projected to show zero growth which is line with the FAA TAF.

3.6.5. Military Operations

With constant changes in national security and relief needs, military operations tend to fluctuate over time. At GSP, local and itinerant military operations have followed this characteristic trend over the last 10 years. In 2016, total military operations stabilized at 2,483 total and it is forecasted that GSP will maintain this plateau of operations for the next 20 years. The FAA TAF reports zero growth in military operations at GSP. However, it is anticipated that occasional local and itinerant military operations will occur as they have in the past with the C-130 conducting the majority of these.

Table 3-16 shows the forecasted annual operations by type.

Table 3-16: Annual Operations Forecast by Type

Year	Air Carrier	Air Taxi	General Aviation			Military			Total Ops.
			Itinerant	Local	Total	Itinerant	Local	Total	
2017	20,242	14,071	7,171	350	7,521	1,715	768	2,483	44,317
2022	32,491	3,957	7,281	350	7,631	1,715	768	2,483	46,562
2027	35,445	3,808	7,393	350	7,743	1,715	768	2,483	49,479
2037	41,066	4,363	7,623	350	7,973	1,715	768	2,483	55,885
CAGR	3.79%	-5.98%	0.32%	0.00%	0.31%	0.00%	0.00%	0.00%	1.23%

Source: FAA Terminal Area Forecast, 2017

3.6.6. Aircraft Fleet Mix

As eluded to previously in Section 3.2, both commercial and general aviation aircraft are getting progressively more fuel efficient with improved engines and aerodynamic design. Engine technology will yield quieter, more fuel-efficient engines, while aircraft design may slightly change the aircraft shape, primarily in the form of increased wingspans. Table 3-17 contains a representative sample of the existing and anticipated future fleet mix for GSP. It is important to note that aircraft not yet in the market place, such as a large passenger turboprop or a new generation of regional jets is not reflected as they are not in the current manufacturer marketplace but have the potential to exist inside the 20-year horizon.

Table 3-17: Aircraft Fleet Mix

Category	Existing (2017)	Future (2037)
Commercial Service (Air Carrier)	Embraer 145	Embraer 175
	Bombardier CRJ-900	C-Series CS 110/130
	McDonnell Douglas MD-88	Boeing 737 Max-8
	Boeing 767-300F (Cargo)	Boeing 747-8F (Cargo)
	61.6%	73.5%
General Aviation Itinerant (Including Air Taxi)	Falcon 2000 LXS	Pilatus PC-12
	Cessna Citation 525	Embraer Phenom 300
	Beech Baron	Dassault Falcon 5X
	Hawker 850	Gulfstream G500
	32%	21.5%
General Aviation Local	Cessna 208 Caravan	Beech Super King Air 350
	Cessna Skyhawk (172)	Diamond DA-42
	0.8%	0.6%
Other	C-130 (Military)	C-130J (Military)
	5.6%%	4.4%

Source: McFarland Johnson, 2017

3.6.7. Peaking Characteristics – Aircraft Operations

Like the peaking characteristics used for passenger enplanements, annual operations numbers when divided equally over the year and throughout the day will not accurately identify capacity constraints or facility needs during busier periods. To accurately identify airport requirements for facility planning, peaking characteristics are broken down into the following elements:

Peak Month – The GSP passenger market is more balanced on an annual basis compared to similar sized airports. Like passenger enplanements, there is no significant peak in activity on an annual basis for commercial activity. With general aviation factored in for the overall airport operational counts, recreational activity is elevated in the summer and fall months. A review of air traffic records resulted in a peak month of approximately 9.4 percent, for consistency purposes, the same peak month metric of 9.5 percent will be used for operations (equal distribution equates to 8.3 percent).

Average Day Peak Month – The average day of the peak month (ADPM) is the industry standard measure used when planning and analyzing the airport's peaking characteristics. In the case of GSP, August is the peak month, with July and October also being above average, therefore the peak month activity is divided by 31 days.

Peak Hour – Peak hour operations is a critical metric when planning for airfield capacity. Traditionally the operational peak hour typically represents between 12 percent and 17 percent of the daily operations total. The busiest hour based on existing (October 2017) flight schedules is 13 operations (arrivals and departures) and airline operations account for 80% of total operations. The resulting 16 existing peak hour operations represents 12 percent of the daily total,

which is within the generally accepted planning range and will be applied to future year peak hour levels.

Peak operational characteristics for GSP are displayed in Table 3-18.

Table 3-18: Peak Hour Operations

	Existing	2022	2027	2037
Operations	44,632	46,562	49,479	55,885
Peak Month	4,240	4,423	4,701	5,309
Average Day Peak Month	137	143	152	171
Peak Hour	16	17	19	21

Source: McFarland Johnson, 2017

3.7. BASED AIRCRAFT

Forecasting the number and type of based aircraft is critical to planning future GA facilities, especially for the type and size of hangars and aircraft movement and parking areas. The growth elements below discuss the factors that influence the number of based aircraft at GSP

3.7.1 Growth Elements

As with operations, growth elements effecting based aircraft at GSP are expected to generally follow national trends related to general aviation fleets. The growth rates used in this forecast represent those in the most recent FAA Aerospace Forecast for 2017 to 2037. As shown in Table 3-19, piston aircraft are forecasted to follow a negative growth rate over the next 20 years while turbine aircraft will grow positively throughout the planning period. This trend is consistent with previous statements regarding fuel efficiency and aircraft technologies.

Piston – Locally, there are multiple general aviation airports that provide FBO services within GSP's ASA. Donaldson Field, Greenville Downtown, and Spartanburg Downtown Memorial Airport are each within a 30-minute drive of the Airport and totaled 329 based aircraft in 2015. The appeal and availability of GA-specific airports negatively impacts the number of based piston engine aircraft at GSP. Nationally, as the economic advantage of aircraft leasing, renting and fractional ownership becomes more popular, the number of newly purchased piston engine aircraft is decreasing in most regions. It is forecast that GSP will follow a negative trend for single and multi-engine based aircraft at a rate of -0.9 percent CAGR and -0.5 percent CAGR respectively.

Turbine – As the full owner and operator of the FBO, GSP has elevated the services available to based and transient aircraft. With this, and the national forecast for based turbine aircraft following a positive trend, it is forecasted that turbo propeller and turbo jet aircraft will increase at a rate of 2.3 percent CAGR and 1.9 percent CAGR throughout the planning period.

Table 3-19: Based Aircraft Forecast

Year	Piston			Turbine			Total Based Aircraft
	Single	Multi	Total	Turbo Prop	Turbo Jet	Total	
2017	5	6	11	4	11	15	26
2022	5	6	11	4	13	17	28
2027	4	6	10	5	14	19	29
2037	4	6	10	5	16	21	31
CAGR	-0.9%	-0.5%	-0.8%	1.4%	2.3%	1.9%	1.1%

Source: FAA National Aerospace Forecast 2017-2037

3.8. FORECAST SUMMARY

Table 3-20 presents a summary of the aviation demand forecasts developed for GSP. These forecasts are considered reasonable and achievable and will be used throughout the Master Plan Update in the development of facility requirements and the identification of alternatives.

Table 3-20 Aviation Demand Forecast Summary

	FORECAST			
	Existing	2022	2027	2037
Enplanements				
Air Carriers	1,014,611	1,182,700	1,333,823	1,648,052
Peak Hour	622	725	818	1,010
Aircraft Operations				
Air Carrier/Airline	20,242	32,491	35,445	41,066
Peak Hour	21	22	23	27
General Aviation				
GA Itinerant*	7,171	11,238	11,201	11,986
GA Local	350	350	350	350
Military	2,483	2,483	2,483	2,483
Based Aircraft				
Single	5	5	4	4
Multi	6	6	6	6
Turbo Prop	4	4	5	5
Turbo Jet	11	13	14	16

Note: GA Itinerant Operations include air taxi

Source: McFarland Johnson 2017

3.8.1. Comparison with FAA Terminal Area Forecast

To confirm validity, master plan aviation forecasts are often compared with other aviation forecasts prepared for the airport and the region. Ideally, this report's forecasts should be reasonably consistent with other forecasts of future airport activity, and compatible with forecasts for the larger region. With master plan forecasts being much more specific to the airport, it is not

unusual to see some variation from national forecasts. The most useful forecasts for comparison are those prepared by the FAA with the standard being the TAF and the national and regional forecasts previously referenced in this report. The TAF is prepared annually and includes airport forecasts for all active NPIAS airports. **Table 3-21** shows the compared results between the selected forecast and that of the FAA's TAF.

The comparison shows that the results of the Master Plan forecast are within the allowed tolerances permitted by the FAA (10 percent within 5 years; 15 percent within 10 years) and is considered reasonable for planning purposes. Facility improvements associated with passenger enplanements may want to consider construction in advance of the forecast years to avoid temporary facilities required from a short-term spike in demand.

Table 3-21: Aviation Demand Forecast vs. FAA Terminal Area Forecast

	ACTUAL	FORECAST			
	2016	2017	2022	2037	Growth
FAA TAF (2016)					
Enplanements	987,307	983,978	1,077,708	1,348,414	1.48%
Total Operations	47,315	44,317	46,562	55,885	1.23%
Master Plan Forecast					
Enplanements	987,307	1,014,611	1,182,700	1,648,052	2.46%
Total Operations	47,315	44,317	46,562	55,885	1.23%
Pct. Difference From TAF					
Enplanements	0.00%	3.11%	9.74%	22.22%	-
Total Operations	0.00%	0.00%	0.00%	0.00%	-

Source: McFarland Johnson, 2017

3.9. FUTURE DESIGN AIRCRAFT

The Runway Design Code (RDC) used in airport planning is derived from the features of the most demanding aircraft using the airport on a regular basis coupled with the best available instrument approach minimums. The first component, depicted by a letter, is the Aircraft Approach Category (AAC) and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the Airplane Design Group (ADG) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by Runway Visual Range (RVR) values. **Table 3-22** displays the RDC criteria used in airport planning.

The Boeing 767-300F combined with the similar Airbus A300-600F currently meet the critical aircraft requirement of a minimum of 500 annual itinerant operations at GSP and are classified as a D-IV aircraft. However, as cargo and air carrier traffic increases, the critical aircraft is forecast to change in the intermediate future and again in the distant future. The Boeing 747-400F, classified as D-V, is currently operating 200 to 300 operations per year at GSP and is forecast to become the design aircraft in the next five to 10 years. In the distant future, the Boeing 747-8F is anticipated to replace the Boeing 747-400F as the critical aircraft for the airport and will require D-VI design standards. **Table 3-23** presents the design details for each of these aircraft.

Table 3-22: FAA Airport Reference Code

FAA Airport Reference Code Parameters				
Category	Approach Speed	Group No.	Wing Span (ft.)	Tail Height (ft.)
	(knots)	I	< 49	< 20
A	<91	II	49 to < 79	20 to < 30
B	91 to < 121	III	79 to < 118	30 to < 45
C	121 to < 141	IV	118 to < 171	45 to < 60
D	141 to < 166	V	171 to < 214	60 to < 66
E	166 or more	VI	214 to < 262	66 to < 80

Source: FAA AC 150/5300-13A

Table 3-23: Future Design Aircraft

	Future Design Aircraft		
Aircraft Model	B767-300F	B747-400	B747-8F
Length Overall	180 ft.	232	250
Wingspan	156 ft.	213	224
Tail Height	53 ft.	64	63
Main Gear Width	30 ft. 6 in.	36 ft. 1 in.	36 ft. 1 in.
Cockpit to Main Gear	64 ft. 7 in.	84 ft. 0 in.	97 ft. 4 in.
Maximum Takeoff Weight	412,000 lbs.	875,000 lbs.	987,000 lbs.
Typical Approach Speed	145 kts.	158 kts.	159 kts.
Approach Speed Category	D	D	D
Aircraft Design Group	IV	V	VI

Source: FAA AC 150/5300-13A

3.10. LONG RANGE PLANNING

The project development process (planning, environmental, design and construction) for large scale airport improvements can often take in excess of 10 years meaning that the planning process begins long before the project objectives are necessary. While many uncertainties exist beyond the 20-year planning period, forecast results were developed for the 2045, 2055 and 2065 planning-year horizons. Facility requirements and alternatives will identify potential facility land development needs to ensure that short term development does not impede long term facility needs. Table 3-24 contains the forecast highlights for the beyond planning period horizons.

Table 3-24: Long Range Planning Forecast

	Enplanements	Air Cargo (pounds)	Operations	Based Aircraft
2045	2,153,123	302,738,694	63,895	35
2055	2,745,443	500,219,598	72,203	39
2065	3,500,708	826,520,202	81,592	44

Source: McFarland Johnson, 2017

3. Aviation Forecasts

3.1. INTRODUCTION

The purpose of aviation forecasting is to outline future growth of significant areas of activity over a 20-year period at Greenville-Spartanburg International Airport (GSP or the Airport). The Federal Aviation Administration (FAA) requires that all airport planning efforts be based upon an approved forecast methodology as the resulting analysis assists in determining the facility requirements for meeting future demand.

The key elements of this chapter include:

- Forecast Influencing Factors
- Socioeconomic Trends
- Passenger Enplanements
- Air Cargo
- Aircraft Operations
- Based Aircraft
- Forecast Summary
- Future Design Aircraft
- Long Range Planning

Key metrics of the aviation forecasts and their focus at GSP include the following:

Annual Passenger Enplanements – The number of people boarding aircraft at GSP each year, which is used to identify the need for future passenger terminal area space, parking facilities, and airport access. In the dynamic commercial aviation industry forecasting passenger enplanements requires a broad view of trends and influencing factors as opposed to looking at past relationships through regression analysis. These growth-influencing factors range from socioeconomic patterns to air service analyses.

Aircraft Operations – The number of takeoffs and landings at GSP each year, which is used to determine the necessary capacity of the airfield and aircraft operating area. A takeoff and landing is each counted individually as one operation.

Based Aircraft by Type – The number and type of general aviation aircraft maintained at the airport on a permanent basis, which is used to identify the space requirements of future facilities.

Air Cargo Activity – The weight, in pounds, of air freight and air express shipments to/from GSP annually, which is used to determine the size of future cargo facilities.

General Aviation Operations – The estimated number of general aviation takeoffs and landings at GSP, which used to determine the necessary capacity of the airfield and GA support facilities.

The forecast efforts will carefully consider the uses and applications for which the forecast demand will be applied. An emphasis has been placed on activity indicators that drive facility planning such as peak hour enplanements, air cargo and general aviation demand.

3.2. FORECAST INFLUENCING FACTORS

The forecast analysis for the GSP master plan reflects a snapshot in time based on historical trends and industry data from the year 2017. Influencing factors presented in this section identify considerations and areas of uncertainty that provide additional context for the GSP forecast. Changing variables and guaranteed uncertainty are underlying reason for the dynamic master plan approach which includes the scenario based forecasts and Dynamic Analysis Tool that combine to enhance the utility of the forecast as the industry evolves.

3.2.1. Service Area

As defined in Chapter 2 – *Inventory*, the Airport Service Area (ASA) encompasses all areas within a 60-minute drive of GSP. The Airport is the only commercial service airport within the ASA with Asheville Regional (AVL), Charlotte/Douglas International (CLT), and Hartsfield – Jackson Atlanta International Airport over an hour drive away. Several general aviation (GA) airports are located near GSP that act as both reliever and public use airports.

The general aviation service area is generally defined as a 30 nautical miles (nm) ring centered on GSP. There are four airports within this area of which GSP is the sole commercial service airport. Two of the four airports have ILS services and Donaldson Field Airport (GHY) provides the next largest runway in the area at 8,000 feet.

For both commercial and general aviation, changes in facilities or activity at other airports in the service area have the potential to affect demand and activity levels at GSP both positively and negatively.

Considerations for the local economy are based on existing conditions and past performance. Analysis and speculation regarding possible future economic performance is not part of this master plan. However, any significant future changes in the local economic performance, for better or for worse, would warrant a cursory review of the forecast inputs and assumptions.

3.2.2. Aviation Industry

The airline industry is evolving rapidly to maintain sustained profitability as the economy continues to improve. There have been a number of airline mergers reducing overall system capacity and affecting individual market competition. These mergers have created more efficient airlines with increased load factors and profits, primarily resulting from reduced competition and unbundled products driving new ancillary revenues for things such as checked baggage and seat assignments.

The decreases in fuel price across the country have also facilitated record profits for most US airlines in 2015. As of August 2017, this trend has plateaued and airlines may be susceptible to the pressure of rising fuel costs once again. Recovery of the economy has led to steady increases in leisure and business travel while the airlines have continued slow growth in seating capacity. The net result between the economy, airline mergers and the growth of ancillary services and fees is fewer flight options nationwide, moderately higher ticket costs to the passengers, and stronger

airline profits. The bulk of the traffic growth has been occurring at large-hub airports where competition is at its greatest.

Some specific aviation industry influencers include:

Pilot Supply – In recent years the industry has begun to see impacts associated with a reduced number of pilots entering the aviation industry. Reduced pay, with the onset of regional jet flying in the 2000's, and regulatory changes requiring 1500 hours for first officers have added to an already increasingly expensive training process. These are compounding factors that will likely increase the severity of this issue in the coming years. Some industry groups also predict a similar shortage in qualified aircraft mechanics as well. Limited pilot supply is a contributing factor to the recent aircraft upgauging trend.

NextGen – For the past 10 years, the FAA has been incrementally implementing new technology with the broader goal of modernizing the nation's air traffic control system. Some of the key objectives involve improving the safety and efficiency of airspace in and around high-volume airport regions such as Atlanta, New York and Washington. These improvements may not have a noticeable impact on GSP's operational efficiency; however, it may reduce delays to hub airports and provide the opportunity for additional schedule frequencies resulting in an improved passenger experience.

Fuel Prices – Over the past 10 years the aviation industry has demonstrated its sensitivity to fuel prices and their impact on operational cost and ultimately aviation demand. On average, fuel represents approximately one-third of the cost of commercial aviation activity. Thus, during spikes in fuel prices like in 2008, the impacts to both supply and demand are tremendous. Advancements in fuel technology will help reduce industry sensitivity to fuel although it will likely continue to be a key influencer for activity for some time.

Aircraft Technology – Over the past 20 years there have been significant advances and innovations to aviation and aircraft technology. With global positioning system (GPS) technology, unmanned aerial systems (UAS) and single pilot operations for complex aircraft systems, the next 20 years will likely yield numerous additional advances in technology that could impact various airline business models. Monitoring and maintaining an awareness of technology enhancements and potential applications for GSP will help ensure the airport is always well-positioned to respond to a changing industry.

3.3. SOCIOECONOMIC TRENDS

This section presents social and economic factors to better understand how each, either separately or in combination with other factors, relates to and influences aviation activity. Key indicators such as population, employment, and personal income per capita were analyzed for areas identified as significant for aviation forecasting. The United States, the Southeastern United States, The State of South Carolina (SC), the GSP Catchment Area, the Greenville-Spartanburg-Anderson Economic Area, the Greenville-Spartanburg-Anderson, SC Combined Statistical Area (CSA) and The Counties of Greenville and Spartanburg were each examined as part of this forecast and are defined as follows:

- *United States of America:* United States of America

- *Southeast*: The States of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia
- *South Carolina*: The State of South Carolina
- *The GSP Catchment Area*: The Counties of Buncombe, Burke, Cherokee, Clay, Cleveland, Graham, Haywood, Henderson, Jackson, McDowell, Macon, Madison, Mitchell, Polk, Rutherford, Swain, Transylvania, and Yancy in North Carolina, as well as Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, McCormick, Newberry, Oconee, Pickens, Richland, Saluda, Spartanburg, and Union Counties in South Carolina
- *The Economic Area*: Polk County, NC and Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, McCormick, Oconee, Pickens, Spartanburg, and Union Counties, SC as defined by the Bureau of Economic Analysis, 2007
- *CSA*: Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, Oconee, Pickens, Spartanburg, and Union Counties, SC
- *Greenville, SC*: The County of Greenville, SC
- *Spartanburg, SC*: The County of Spartanburg, SC

3.3.1. Population

Population is often a strong indicator of the potential for activity and growth at an airport as the higher the population growth, the more likely growth in operations and enplanements at an airport will be more stable. Population in the Southeast United States is forecast to increase more rapidly than the U.S. average over the next 25 years. The groupings of this and various other geographic sectors are shown in Table 3-1.

Table 3-1: Historical and Forecast Percentages of Growth in Population

Year Range	United States	SE	South Carolina	GSP Catchment Area	Economic Area	CSA	Greenville County	Spartanburg County
1969-2015	1.02%	1.40%	1.41%	1.19%	1.26%	1.27%	1.61%	1.20%
2016-2041	0.87%	1.07%	1.16%	0.81%	0.85%	0.88%	1.21%	0.77%

Note: SE = Southeast

Source: Woods and Poole Economics, 2017

Greenville County population growth outpaced the other sectors between the years 1969 and 2015 with an average annual growth rate of 1.61 percent. The State of Carolina came in second with an average annual growth rate of 1.41 percent, followed closely by the Southeast with 1.40 percent. The United States Population experienced the slowest average annual rate of growth of all the sectors analyzed, with an average annual growth rate (AAGR) of 1.02 percent.

The rate of growth over all the areas is anticipated to be less within the next 25 years than it previously was. Greenville County is expected to have a higher rate of average annual growth, at 1.21 percent, than all the sectors examined. South Carolina and the Southeast are also expected to continue to outperform the national average with 1.16 and 1.07 percent AAGR respectively.

3.3.2. Employment

Between the years of 1969 and 2015, Greenville County outperformed every other sector with an average annual growth rate in employment of 2.28 percent AAGR. This was followed by the Southeast sector with 1.94 percent AAGR and South Carolina with 1.78 percent AAGR as shown in Table 3-2. The sector with the lowest average annual rate of growth was the GSP Catchment Area at 1.54 percent AAGR, which was only marginally better than Spartanburg County with 1.55 percent AAGR in employment.

Although periodic business cycles, such as the 2008-2009 recession, have interrupted and changed the growth trajectory, the nation's employment is generally expected to rise over the next 25 years with steady job gains. The rate of growth between 2016 and 2041 is predicted to be less than that of the previous 46 years, but it is anticipated to be steady. Greenville County is forecast to continue to lead the sectors with 1.46 percent AAGR. South Carolina is projected to follow with 1.4 percent AAGR and the Southeast with 1.34 percent AAGR. The lowest performing sector is anticipated to be Spartanburg County with 1.08 percent AAGR for employment.

Table 3-2: Historical and Forecast Percentages of Total Employment

Year Range	United States	SE	South Carolina	GSP Catchment Area	Economic Area	CSA	Greenville County	Spartanburg County
1969-2015	1.61%	1.94%	1.78%	1.54%	1.60%	1.61%	2.28%	1.55%
2016-2041	1.22%	1.34%	1.40%	1.13%	1.17%	1.17%	1.46%	1.08%

Note: SE = Southeast
Source: Woods and Poole Economics, 2017

3.3.3. Per Capita Personal Income

Per capita personal income (PCPI) has also been found to be a good indicator of potential growth at an airport, as increases in income can yield a greater ability and desire to travel among the population within the area. The percentages of average annual growth in PCPI are shown for each of the sectors in Table 3-3.

Table 3-3: Historical and Forecast Total Percentages of PCPI

Year Range	United States	SE	South Carolina	GSP Catchment Area	Economic Area	CSA	Greenville County	Spartanburg County
1969-2015	5.59%	5.77%	5.83%	5.71%	5.64%	5.69%	5.74%	5.75%
2016-2041	4.45%	4.50%	4.56%	4.39%	4.33%	4.37%	4.37%	4.35%

Note: SE = Southeast
Source: Woods and Poole Economics, 2017

The average annual rate of growth for per capita personal income, in current dollars, were higher than those for population and employment and more closely grouped both historically and in the forecasts. Between the years 1969 and 2015, the highest rate of growth for per capita personal income was experienced by South Carolina with 5.83 percent AAGR. This was followed by the Southeast with 5.77 percent AAGR and Spartanburg County with 5.74 percent AAGR. Greenville

came in at a close fourth with 5.74 percent AAGR. The lowest average annual rate of growth in per capita personal income was experienced by the United States with an average annual rate of growth for personal income per capita of 5.59 percent AAGR.

The highest performing sector for average annual growth rate for per capita personal income between the years 2016 and 2041 is predicted to be South Carolina at 4.56 percent AAGR. The Southeast and the United States are forecast to be second and third of those sectors studied with 4.50 and 4.45 percent AAGR respectively. The sector forecast to have the lowest average annual rate of growth in per capita personal income between the years 2016 and 2014 is the Economic Area with an average of 4.33 percent AAGR growth in personal income per capita.

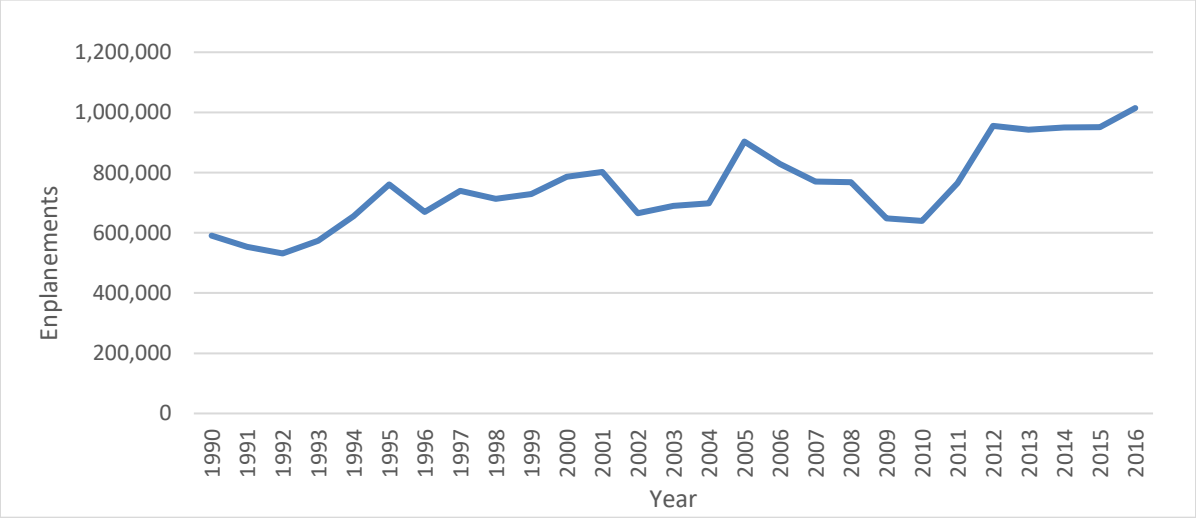
3.4. PASSENGER ENPLANEMENTS

Passenger enplanements are a key measure in the forecasting efforts for commercial service airports. The enplanements forecast focuses on the total annual enplanements as well as the peak hour characteristics of busier traffic periods. The results of these forecasts are particularly useful in the assessment of the passenger terminal building and associated facilities such as auto parking lots. Beyond that, the types and quantities of growth extend beyond the terminal area itself to impact elements such as roadways and transportation networks, helping to ensure that they are adequately sized for future demand.

3.4.1. Historical Activity

The historical data for passenger enplanements presented in **Figure 3-1** and **Table 3-4** depicts stable and consistent growth, not only over the past 10 years, but also over the past 25 years. This consistent growth in the shadow of growing airline hubs, three recessions, 9/11 and three airline mergers is a testament to the resilience of the overall GSP market.

Figure 3-1: Historical Passenger Enplanements



Source: GSP Airport Records, 2017

Table 3-4: Historical Passenger Enplanements

Year	Passenger Enplanements
1990	590,279
1991	554,026
1992	531,593
1993	573,878
1994	655,135
1995	760,918
1996	669,825
1997	739,584
1998	712,733
1999	728,735
2000	786,087
2001	802,132
2002	665,458
2003	690,038
2004	697,698
2005	903,503
2006	828,639
2007	770,406
2008	768,162
2009	648,657
2010	639,646
2011	764,626
2012	955,821
2013	942,465
2014	950,205
2015	951,148

Source: GSP Airport Records, 2017

3.4.2. Existing Forecasts

Several forecasts of activity already exist and were reviewed as part of the preliminary forecast efforts.

FAA TAF – The FAA Terminal Area Forecast (TAF) is a high-level forecast developed by FAA headquarters using macro-level inputs of national and regional data with the airport specific forecast being the result of broad-based forecast applications. While generally understood not to be a detailed reflection of local market demand, the TAF is considered by the FAA to be the basis from which a detailed forecast will be measured. The FAA TAF depicts a compound annual growth rate (CAGR) of 1.46% for GSP between 2016 and 2037.

FAA Aerospace Forecast – The National Aerospace Forecast is issued annually by the FAA and contains guidance on a variety of industry segments, including passenger traffic. This forecast projects a 1.7 percent CAGR for air carrier passengers identified in the 2017-2037 FAA Aerospace Forecast.

2010 Terminal Area Study – The forecasts developed as part of the *2010 GSP Terminal Area Study* were extrapolated to coincide with the forecast horizons for the master plan. Both the baseline forecast and low cost carrier (LCC) scenarios were extrapolated; it should be noted that the LCC scenario assumes nine flights via Southwest in 2017, compared to the current level of three.

The existing GSP forecasts are displayed in Table 3-5.

Table 3-5: Existing GSP Forecasts

Year	TAF	FAA Aerospace	2010 Terminal Study Base	2010 Terminal Study LCC
Existing (2016)	990,512	1,014,610	763,800	873,200
2022	1,077,708	1,122,600	831,800	1,202,002
2027	1,163,109	1,221,320	940,600	1,466,400
2037	1,348,414	1,445,570	1,213,600	1,902,000
CAGR	1.48%	1.70%	2.55%	2.74%

Source: FAA.gov, August 2017, GSP Terminal Area Study, October 2010

3.4.3. Forecast Methodologies

In addition to existing forecasts, several methodologies were explored to create additional forecasts for consideration using socioeconomic adjustments, service area dynamics and historical growth rates.

Population Adjusted Aerospace Forecast – The economic area for GSP has outperformed national average growth rates for population growth by approximately 24 percent. This forecast adds 24 percent to the aerospace forecasts growth rate for a CAGR of 2.61 percent.

Peer Airport Growth – One methodology included a review of airports similar to GSP and their historical performance and associated TAF forecasts. The analysis looked at airports with similar enplanement levels to GSP that were also within a two-hour drive of a large hub airport. Airports identified include; Birmingham, AL, Grand Rapids, MI, Harrisburg, PA and Lexington, KY. Of these airports, only Grand Rapids had higher historical growth in the 10 and 25-year periods with GSP outperforming the rest of its peers. The TAF however, identifies higher growth rates for each of the peer airports projecting GSP to underperform despite the strong track record for historical growth that GSP has experienced.

The peer average growth rate for these airports identified in the TAF is 1.91 percent CAGR; this methodology continues the overage in which GSP has outperformed peer airports relative to the peer group average TAF forecast resulting in a projected growth rate of approximately 2.26 percent CAGR.

Market Share – The market share forecast methodology considered GSP's position in the regional airport market relative to Asheville (AVL) and Columbia (CAE). Atlanta and Charlotte were excluded from the analysis as the passenger volumes at both of the large airports would dwarf the region thereby eliminating any statistical observations. GSP's market share is currently approximately 50.95 percent relative to AVL and CAE, increasing at a rate of 1.2 percent CAGR. The base growth for the combined three airport region uses the 1.7 percent CAGR from the FAA Aerospace Forecast. The effective resulting growth rate is 1.63 percent CAGR for GSP.

Population Adjusted Market Share – The population adjusted market share is similar to the previous market share methodology however, it contains a socioeconomic adjustment for population as the broader region outperforms national trends for population growth. The effective resulting growth rate is 2.58 percent CAGR for GSP.

Historical 25 Year Growth – This forecast methodology uses the 25-year historical compounded annual growth rate (CAGR) for GSP of 2.0 percent CAGR. This growth rate accounts for the effects of 9/11, three economic recessions and multiple airline mergers.

Post 9/11 Growth – This forecast methodology uses the post 9/11 historical CAGR for GSP of 2.78 percent CAGR. This growth rate accounts for the post 9/11 recession, the great recession of 2008-2010 and multiple airline mergers.

The resulting methodologies contain 2037 enplanement levels ranging from 1,423,577 to 1,805,596 with growth rates ranging from 1.63 percent CAGR to 2.78 percent CAGR as displayed in Table 3-6. These various methodologies are also consistent with the existing forecast ranges identified in the previous section.

Table 3-6: Forecast Enplanements by Methodology

	Pop. Adj. FAA Aerospace	Peer TAF Airport Growth	Adj. TAF Peer Airport Forecast	Market Share	Pop. Adj. Mkt. Shr.	Historical 25 yr.	Historical Post 9/11
Existing	1,014,610	1,014,610	1,014,610	1,014,619	1,014,610	1,014,610	1,014,610
2022	1,184,233	1,123,925	1,160,203	1,105,520	1,176,471	1,142,616	1,196,054
2027	1,347,056	1,223,965	1,297,367	1,202,739	1,338,227	1,261,540	1,371,810
2037	1,742,941	1,451,552	1,622,261	1,423,577	1,731,517	1,537,810	1,804,596
CAGR	2.61%	1.72%	2.26%	1.63%	2.58%	2.00%	2.78%

Source: McFarland Johnson Analysis, 2017

3.4.4. Air Service Analysis

Following a review of the previous forecast methodologies that involved various growth rates, an independent analysis was conducted regarding historical and projected scheduled air service levels to further inform the enplanements forecast. For this analysis, schedule data was analyzed for a peak day (Thursday) during the peak month (August) for 2007, 2012 and 2017. These peak characteristics were normalized to reflect an annual number (peaking characteristics are detailed later in the chapter).

Several industry trends were prominent in the review of air service changes over the past 10 years at GSP:

Airline and Hub Consolidation – In 2007, GSP was served by each of the major legacy carriers of the time including Continental, Northwest, and US Airways, each of which have since been acquired. As a result of these mergers, several airline hubs have been eliminated or scaled down, with the subsequent effect of GSP no longer having service to cities like Cincinnati, Cleveland and Memphis.

Low Cost Airline Growth – Low cost and less than daily service was still in its infancy in 2007 when GSP had twice-weekly service on Allegiant to two destinations in Florida. Service has since grown to additional destinations with weekly frequencies, a trend noticeable at many airports comparable to GSP. The previous 10 years has also seen the introduction of service by Southwest Airlines. Southwest expanded to several markets comparable to GSP, both organically, and also as result of their acquisition of AirTran Airways. The historical airline schedules also clearly show Southwest's shift from a network of focus cities to larger concentrations similar to that of a network airline hub, while not operating as such (no time-coordinated connections).

Aircraft Upgauging – From 2007 to 2017, GSP had nearly 18 percent fewer average scheduled daily departures while transporting over 35 percent more passengers. Industry wide, and especially at small and medium sized airports, regional jets and turboprops with 50 seats or less are being consolidated into larger regional aircraft. In most cases, these larger aircraft come at the expense of frequency. GSP markets that have benefitted from the larger aircraft are primarily the larger, busier airports such as Atlanta, Charlotte, Chicago and Dallas.

Historical scheduled air service activity is detailed in Table 3-7.

Table 3-7: Historical Air Service Activity

Airline	Destination	2007		2012		2017	
		Peak Daily	Seats	Peak Daily	Seats	Peak Daily	Seats
American	CLT	8	387	8	374	8	478
(US)	DFW	4	200	3	150	3	228
	ORD	3	150			3	150
	DCA	3	150	3	150	2	139
	PHL*	3	150	3	150	4	200
	LGA	2	100				
	TOTAL	23	1137	17	824	20	1195
Delta	ATL	8	610	10	818	8	1013
(NW)	DTW	3	150	4	200	4	245
	CVG	5	224	1	50		
	NYC*	2	100	2	100	2	145
	MCO	1	50				
	MEM	3	150				
	TOTAL	22	1284	17	1168	14	1403
Southwest	ATL					3	429
	BWI			2	274		
	MDW			2	280		
	HOU			1	137		
	BNA			1	137		
	MCO			1	143		
	TOTAL			7	971	3	429
United	EWR*	3	150	3	150	3	150
(CO)	IAH	3	137	2	100	1	50
	IAD	3	150	3	150	3	150
	CLE	2	100	1	50		
	ORD	3	150	3	150	4	252
	TOTAL	14	687	12	600	11	602
Allegiant	SFB	0.3	45	0.3	45	0.3	53.1
(AVG DLY)	PIE	0.3	45	0.3	45	0.3	53.1
	PGD			0.15	22.5	0.15	26.55
	FLL			0.3	45	0.3	53.1
	TOTAL	0.6	90	1.05	157.5	1.05	185.85
GSP TOTAL		59.6	3198	54.05	3720.5	49.05	3814.85
Monthly Seats		1,755	94,181	1,592	109,569	1,445	112,347
Monthly Enplanements (9.5% of Annual)			72,519		89,846		99,989
Annual TOTAL Enplanements		18,476	763,363	16,756	945,751	15,206	1,052,517

Source: GSP Airport Records, McFarland Johnson Analysis, 2017

Industry trend applications used in the future air service analysis include:

New Airlines and Routes – Industry consolidation has reduced the number of airlines in the domestic market, as a result GSP is served by each of the major network carriers, one low-cost carrier and one ultra-low-cost carrier (ULCC). The timing of introduction of service cannot be predicted and therefore the introduction of a new airline was excluded from this analysis, however derivative forecast scenarios will consider new entrant airline service.

Long-term it is anticipated that congested airports in New York (EWR/LGA/JFK) and Philadelphia will not see additional frequencies, with growth coming from the use of larger aircraft. While no new hubs are anticipated, there are several existing hubs and focus cities that could theoretically be supported from GSP later in the planning period such as Boston, Denver, and Miami, each of which are included in the air service enplanement analysis.

International service is not considered in the air service analysis though it is included in a derivative forecast scenario.

Low Cost Airline Growth – Current trends for LCCs and ULCCs are expected to continue, with additional destinations and weekly frequencies for ULCC service and new service to large focus cities for Southwest such as Baltimore, Houston and Orlando.

Aircraft Upgauging – Similar to the service patterns at GSP from 2007 to 2017, it is anticipated that the remaining 50-seat regional jets will be replaced by larger two-class regional jets in addition to some mainline aircraft on multiple frequencies. The air service model identifies Charlotte, Chicago and New York as having the most notable aircraft upgauges over the 20-year planning horizon.

This independent, air service based methodology produced forecast enplanements generally consistent with the previously identified methods, being slightly greater with a 2037 enplanement level of 1,870,165 and a growth rate of 3.15 percent CAGR.

Projected scheduled air service activity used in the air service forecast methodology is detailed in Table 3-8.

Table 3-8: Projected Air Service Activity

Airline	Destination	2022		2027		2037	
		Peak Daily	Daily Seats	Peak Daily	Daily Seats	Peak Daily	Daily Seats
American	CLT	7	532	7	588	7	700
(US)	DFW	2	264	3	340	3	368
	ORD	3	228	3	228	3	284
	DCA	2	152	2	152	3	228
	PHL*	3	228	3	228	3	284
	MIA	1	50	1	76	1	76
	TOTAL	18	1454	19	1612	20	1940
Delta	ATL	8	1192	8	1280	8	1280
(NW)	DTW	4	304	4	338	4	372
	NYC*	2	152	2	186	2	220
	BOS			1	76	1	76
	TOTAL	14	1648	15	1880	15	1948
Southwest	ATL	4	572	4	572	4	572
	BWI	2	286	2	286	2	286
	HOU					1	143
	MCO			1	143	1	143
	TOTAL	6	858	7	1001	8	1144
United	EWR*	3	176	3	228	3	284
(CO)	IAH	1	76	2	152	3	228
	IAD	2	100	2	100	2	152
	ORD	4	252	4	304	4	304
	DEN					1	76
	TOTAL	10	604	11	784	13	1044
Allegiant	SFB	0.4	70.8	0.4	70.8	0.5	88.5
(AVG DLY)	PIE	0.4	70.8	0.4	70.8	0.4	70.8
	PGD	0.3	53.1	0.4	70.8	0.4	70.8
	FLL	0.3	53.1	0.3	53.1	0.4	70.8
	VPS	0.3	53.1	0.3	53.1	0.3	53.1
	LAS			0.3	53.1	0.3	53.1
	TOTAL	1.7	300.9	2.1	371.7	2.3	407.1
Other (New or Incumbent)							
	TOTAL	2	110	3	186	5	220
GSP TOTAL		51.7	4974.9	57.1	5834.7	63.3	6703.1
Monthly Seats		1,523	146,511	1,682	171,832	1,864	197,406
Monthly Enplanements (90% Load Factor)			130,395		154,649		177,666
Annual TOTAL Deps/Enpl.		16,027	1,372,575	17,701	1,627,881	19,623	1,870,165

Source: GSP Airport Records, McFarland Johnson Analysis, 2017

3.4.5. Selected Forecast

The resilience of the GSP passenger market is demonstrated when comparing historical growth and socioeconomic characteristics. The market has demonstrated consistent growth in the face of strong expansion at large competitive environments at Atlanta and Charlotte, industry changing events such as 9/11, and a reduction in service by Southwest Airlines. Historically GSP has outperformed not only regional market airports and peer airports, but also national averages. The FAA TAF projects under-performance in each of these categories and as such was not selected for use in this master plan.

The sustained growth, socioeconomic-outperformance, and region-leading air service all comprise the key factors that will drive long term growth at GSP. The selected enplanement forecast for GSP is a blended average of all of the previously mentioned enplanement forecasts with a CAGR of 2.46 percent. While the air service scenario was not individually selected, it is anticipated that many of the assumptions and considerations will also be true in the selected baseline master plan forecast. Selected forecast enplanement levels are displayed in Table 3-9.

Table 3-9: Baseline Enplanement Forecast

Year	Enplanements
Existing	1,014,611
2022	1,182,700
2027	1,333,823
2037	1,648,052
CAGR	2.46%

Source: McFarland Johnson, September 2017

3.4.6. Derivative Forecast Scenarios

The following sections outline additional derivative forecasts scenarios that have been developed to address potential market conditions that are reasonably foreseeable but not able to be specifically quantified based on service announcements or contracts. These forecast scenarios will be additive or subtractive to the selected baseline forecast and will be used for facility planning only.

New ULCC Service – Compared to network airlines or even LCCs, the ULCC model favors less than daily service and varying schedules. This scenario considers the introduction of a new ULCC providing an average of 10-weekly frequencies to multiple destinations on aircraft in the 150 to 175 seat range. An additional weekly frequency is added in each subsequent year of the forecast for this scenario.

New LCC Service – Unlike the various schedules of the ULCC model, the LCC model tends to favor large focus cities as opposed to point-to-point or hub-and-spoke models. This scenario considers the introduction of new LCC service to one or two large focus cities with an average of three daily departures on aircraft in the 100 to 120 seat range.

New International Service – Many medium sized airports such as Buffalo, Columbus and Providence have seen the introduction of international service over the past several years and there is potential opportunity for this trend to continue for small-hub airports such as GSP. This scenario will consider the demand and facility impacts associated with the introduction of twice weekly international service to markets such as Cancun on aircraft in the 150 to 175 seat range.

Table 3-10 displays the additional service levels of the three derivative scenarios associated with new service at GSP.

Table 3-10: New Service Derivative Scenarios

Year	New ULCC		New LCC		New International	
	Operations	Enplanements	Operations	Enplanements	Operations	Enplanements
1	1,040	74,880	1,976	83,980	104	7,488
5	1,456	104,832	2,080	89,838	208	14,976
10	1,976	142,272	2,184	97,738	260	18,720
20	3,016	217,152	2,288	115,684	312	22,464

Source: McFarland Johnson, 2017

Market Interruption – While long term growth is anticipated for GSP, there is a potential for a temporary market interruption due to factors unrelated to the local GSP passenger market. Examples of a market interruption include airline network changes (loss of service or bankruptcy), enhanced low-fare competition at CLT, or a 9/11-like national event. This scenario includes a 10 percent drop in passenger demand/traffic with a 5-year recovery period (2 percent annually).

The enumerative value of this impact (10%) would be directly related to the respective year in which the affect would take place.

Enhanced Aircraft Upgauging – While the general trend of aircraft upgauging is contained in the general assumptions of the selected baseline forecast, this scenario will consider upgauging above anticipated levels and the impacts associated with larger aircraft and reduced frequencies. This scenario displayed in Table 3-11 maintains the forecast level of enplanements, however at reduced frequencies due to larger aircraft.

Table 3-11: Enhanced Aircraft Upgauging Scenario

Year	Change in Annual Operations
1	0
5	-2,000
10	-4,000
20	-10,000

Source: McFarland Johnson, 2017

3.4.7. Peak Hour Enplanements/Peaking Characteristics

When divided equally over the year and throughout the day, annual enplanement numbers will not accurately identify specific facility needs. To accurately identify airport requirements for facility planning, peaking characteristics are broken down into the following elements:

Peak Month – The GSP passenger market is more balanced on an annual basis compared to similar sized airports. Between peak summer travel, fall leaf season, holidays and spring break, there are no dramatic peaks in activity. Airport records indicate that August is the most above average period with approximately 9.5 percent of the annual total enplanements (equal distribution equates to 8.3 percent).

Average Day Peak Month – The average day of the peak month (ADPM) is the industry standard measure used in planning and analyzing an airport's peaking characteristics. In the case of GSP, August is the peak month, with July and October also being above average, therefore the peak month activity is divided by 31 days.

Peak Hour – Peak hour enplanements is the critical metric when planning for passenger terminal facilities. At small and medium sized airports, the peak hour is typically associated with the morning originating activity. Flight schedule data indicates that the peak hour for GSP is around the 6 o'clock hour in the morning and represents up to 20 percent of the daily departing seats. Adjacent hours of 5am and 7am are also busy. A normal distribution of a 14-hour day (accounting for single direction of activity) is just over seven percent meaning the 20 percent peak hour for GSP reflects a notable peaking characteristic to be applied when addressing facility requirements.

Peak enplanement characteristics for GSP are displayed in **Table 3-12**.

Table 3-12: Peak Enplanement Characteristics

	Existing	2022	2027	2037
Enplanements	1,014,611	1,182,700	1,333,823	1,648,052
Peak Month	96,388	112,356	126,713	156,565
Average Day Peak Month	3,109	3,624	4,088	5,050
Peak Hour	622	725	818	1,010

Source: McFarland Johnson, 2017

3.5. AIR CARGO

While enplanements, operations and based aircraft are typically viewed as the key forecast metrics for an airport, for GSP, air cargo is another important forecast metric. The FAA TAF does not have a provision for air cargo for comparison. This forecast considers all-cargo carrier activity only and does not include airline belly cargo activity.

Air cargo activity can be measured in two forms:

Landed Weight – Landed weight includes both the freight/cargo as well as the weight of the aircraft itself. The FAA uses landed weight when reporting statistics for all-cargo carriers.

Pounds/Tonnage – Most airports report cargo activity in either pounds or tonnage for mail/express/freight (some report each category separately). This activity is reported as both enplaned and deplaned activity and the aircraft weight is not included in these totals.

The cargo forecast for GSP uses the total (both directions) weight for combined cargo activities (mail/express/freight) in pounds.

The network cargo carriers (UPS and FedEx) have regional processing facilities (cargo equivalent of a focus city) at nearby airports with a FedEx facility at Greensboro (GSO) and a UPS facility at Columbia (CAE). As a result, the majority of GSP cargo involves mail/express/freight destined for or originating from the local Greenville/Spartanburg area. The amount of cargo activity at GSP, despite these processing facilities at other airports, underscores the strength of the local market for air cargo.

Historical demand for air cargo has been strong with a growth rate at nearly four times the national average over the past five years. Historical landed weight and overall pounds for GSP along with growth rates is displayed in Table 3-13.

Table 3-13: Historical Cargo Demand

Year	Landed Weight	Pounds
2002	154,923,100	41,806,000
2003	146,468,200	41,747,017
2004	151,162,700	45,720,706
2005	158,942,800	45,989,732
2006	158,795,700	52,274,546
2007	165,788,304	55,414,531
2008	169,776,120	51,966,318
2009	133,654,250	38,507,819
2010	152,218,275	48,654,867
2011	191,294,860	52,991,146
2012	203,367,812	54,607,566
2013	213,414,150	56,761,250
2014	249,117,397	58,574,065
2015	222,392,195	56,575,883
2016	247,817,497	63,807,773
2017E		89,999,195
5 yr. (2012-2016)	5.07%	3.97%
10 yr. (2007-2016)	4.57%	1.58%
15 yr. (2002-2016)	3.41%	3.07%

Note: E = Estimated

Source: GSP Airport Records, 2017

The current year statistics do not include the full resulting activity associated with the introduction of scheduled service by Senator Logistics Freight Forwarding, LLC (Senator), which is estimated to add over 26,000,000 pounds to the annual totals with potential for some additional service in the near term. Growth for 2017 and 2018 is expected to significantly exceed historical rates.

The methodologies reviewed for air cargo include the following:

Historical Growth Trends – Historical growth rates for the five, 10 and 15-year time periods were used to project future activity levels. Both the five and 15-year trends are over three percent which is over three times national averages for the same period. The 10-year growth rate is lower as this

period includes the Great Recession of 2008-2009, which had a significant impact on air cargo activities nationwide.

FAA Aerospace Forecast – The FAA Aerospace Forecast contains guidance for air cargo in the form of Revenue Ton Miles (RTM) projections for both domestic and international cargo. While RTMs are not the metric used in this forecast or by the Airport, the growth rate is still applicable for use. The FAA Aerospace Forecast identifies a growth rate of 1.7 percent for domestic, and 3.2 percent for international. At GSP, all of the Senator activity is between GSP and Germany and is not reflected in the historical growth rates as the service commenced in late 2016.

The FAA Aerospace Forecast applications used in this master plan include a blend of the domestic and international rates with a growth rate of 2.45 percent CAGR and also a scenario that adjusts the domestic growth for GSP's performance against the national average with an effective growth rate of 4.58 percent CAGR. A third FAA Aerospace Forecast scenario is a blend of both methodologies which is the selected air cargo forecast used as the baseline analysis for this master plan. Forecast air cargo activity (bi-directional pounds) is displayed in Table 3-14.

Table 3-14: Forecast Air Cargo Activity

Year	Historical 5 yr	Historical 10 yr	Historical 15 yr	FAA Aero RTM	FAA Aero Adjusted	FAA Aero Blend (Selected)
2016	63,807,773	63,807,773	63,807,773	63,807,773	63,807,773	63,807,773
2022	109,339,943	97,337,383	104,688,748	101,577,715	112,585,332	107,081,523
2027	132,837,002	105,273,899	121,775,910	114,645,827	140,839,670	127,742,749
2037	196,064,743	123,141,034	164,772,278	146,042,036	220,399,891	183,220,963
CAGR	5.49%	3.18%	4.62%	4.02%	6.08%	5.15%

Source: GSP Airport Records, FAA Aerospace Forecast, McFarland Johnson Analysis, 2017

While the growth rates are higher than the recent historical averages, it is important to note that they include the recent 26,000,000 pounds in additional activity associated with Senator and do not include speculative expansion proposals for the near term.

3.6. AIRCRAFT OPERATIONS

The FAA defines an aircraft operation as a takeoff or a landing and categorizes the operations by aircraft type and purpose. These categories include commercial (all airline operations at the passenger terminal), general aviation (both recreational and corporate), and military. The forecasting of these operations by category is used in the planning of terminal buildings, runways, taxiways and other airport infrastructure.

Growth elements affecting operations at GSP are expected to generally follow national trends related to aviation fleets. The growth rates used in the most recent FAA National Aerospace Forecast for 2017-2037 result in an operational forecast that is in close proximity to the FAA TAF. The air carrier operations totals (discussed later in this section) were also compared to the previously discussed air service scenario, with which it was highly consistent. Based on these strong consistencies with existing forecasts and independent methodologies, this master plan will use the TAF for the selected aircraft operations forecast.

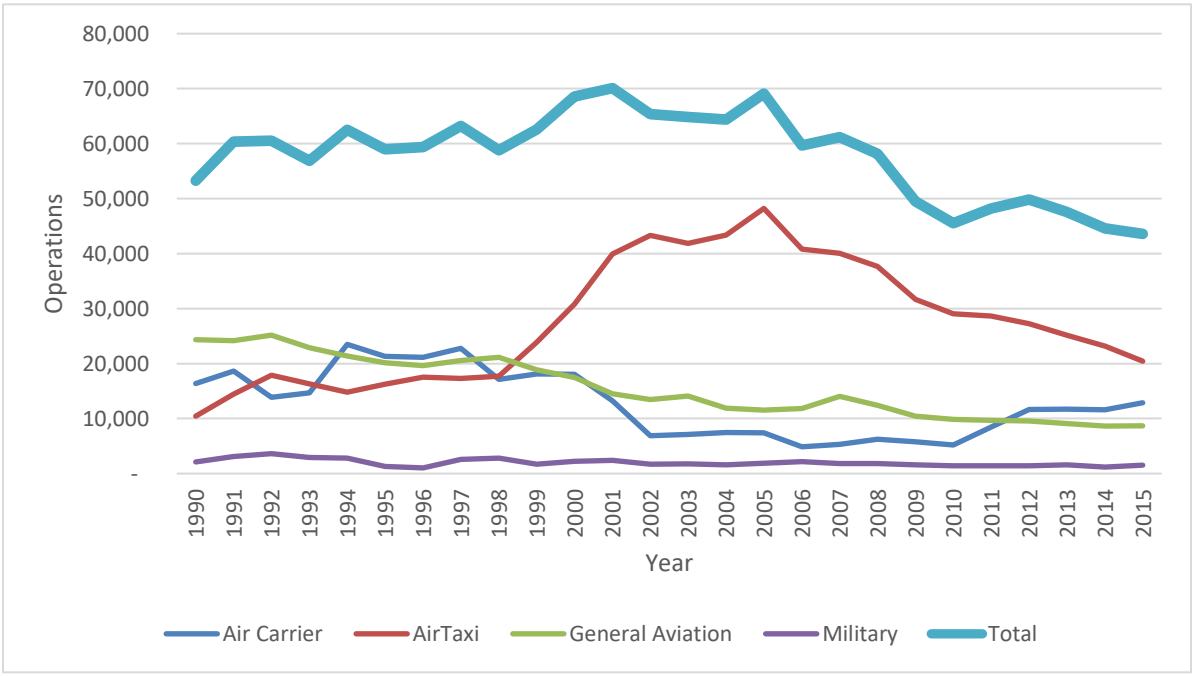
Growth in the total number of aircraft operations over the 20-year forecast period is approximately 1.23 percent CAGR.

Total general aviation operations are projected to increase at an average annual rate of 0.31 percent CAGR during the forecast period. Air taxi operations are projected to decrease at a negative average annual rate of 5.98 percent CAGR. The growth elements discussed for each operation type below include both local and airline industry factors that could impact aircraft operations at GSP.

3.6.1. Historical Activity

The historical data for aircraft operations, shown in **Figure 3-2** and **Table 3-15**, depicts trends for each operational type. Air carrier operations have fluctuated in the last 25 years with the initial growth of air service followed by a reduction in airlines at GSP. However, in the last 10 years, air service operations have slowly increased year over year. Air taxi operations peaked in 2005 at 48,221 and have followed a steady negative trend since. Total general aviation operations have seen a consistent decline historically, with both local and itinerant operations following negative trends, and military operations have remained consistently low over the last 25 years. Overall, the decline in total operations that has been seen historically has plateaued in recent years, with positive trends on the forecast horizon.

Figure 3-2: Historical Aircraft Operations



Source: FAA TAF, 2017

Table 3-15: Historical Aircraft Operations

Year	Air Carrier	Air Taxi	General Aviation	Military	Total
1990	16,356	10,440	24,357	2,100	53,253
1991	18,647	14,432	24,192	3,117	60,388
1992	13,868	17,899	25,172	3,622	60,561
1993	14,686	16,337	22,893	2,939	56,855
1994	23,497	14,809	21,398	2,822	62,526
1995	21,330	16,231	20,141	1,276	58,978
1996	21,164	17,532	19,644	1,031	59,371
1997	22,784	17,284	20,571	2,570	63,209
1998	17,136	17,682	21,157	2,838	58,813
1999	18,145	23,866	18,872	1,694	62,577
2000	18,076	30,783	17,469	2,213	68,541
2001	13,221	39,939	14,525	2,407	70,092
2002	6,902	43,309	13,469	1,709	65,389
2003	7,130	41,862	14,081	1,753	64,826
2004	7,455	43,379	11,914	1,611	64,359
2005	7,410	48,221	11,545	1,909	69,085
2006	4,868	40,810	11,829	2,162	59,669
2007	5,311	40,055	14,035	1,801	61,202
2008	6,248	37,689	12,389	1,834	58,160
2009	5,761	31,674	10,439	1,592	49,466
2010	5,187	29,067	9,862	1,398	45,514
2011	8,460	28,646	9,686	1,418	48,210
2012	11,636	27,260	9,537	1,402	49,835
2013	11,742	25,159	9,073	1,609	47,583
2014	11,599	23,197	8,633	1,176	44,605
2015	12,892	20,440	8,708	1,544	43,584

Source: FAA TAF, 2017

3.6.2. Growth Elements

Air Carrier/Taxi – Industry consolidation has reduced the number of airlines and hubs resulting in fewer nonstop routes than what were once available in the market. New airlines and new markets could be introduced over time, however the timing of introduction of service cannot be predicted and therefore the introduction of a new airline was excluded from this analysis. However, derivative forecast scenarios will consider activity from new airlines.

Trends for LCCs and ULCCs are expected to continue into the future, with additional destinations and weekly frequencies for ULCC service and new service to large focus cities for Southwest such as Baltimore, Houston and Orlando.

Similar to the service patterns at GSP from 2007 to 2017, it is anticipated that the remaining 50-seat regional jets will be replaced by larger two-class regional jets in addition to some mainline

aircraft used to replace multiple frequencies. Larger aircraft in place of greater frequency will maintain or even boost enplanements however it will slow overall operational growth.

General Aviation – At the time of this analysis, the airport has recently become the owner and operator of the FBO at the airport. For many years, general aviation has been only a minor presence on the airfield and with the new management structure, the overall goal is to enhance the general aviation presence at GSP. Presently there are only several months of data which are not sufficient in number to analyze and formulate reliable trends. A review of general aviation activity at GSP relative to industry trends should occur at a later time once multiple years of data are available. The facility requirements and alternatives chapters of this master plan will identify and reserve facilities for enhanced general aviation growth based on GSP's mission and goals for FBO growth.

Military – The growth of military operations is largely dependent on the security interests of the nation. Military aircraft are constantly relocated throughout the aviation system. Threats to the United States and disaster relief efforts may impact the amount of military operations at and around the Airport.

3.6.3. Air Carrier and Air Taxi

Air Carrier operations are those conducted by aircraft with 60 or greater passenger seats. Air Taxi operations include regional and commuter activity and commercial applications within general aviation such as Part 135 charter activity. Historically, the air taxi category has made facility planning difficult because it includes both airline and general aviation operations, however with the rapid retirement in 50-seat regional jet and smaller, nearly all airline operations in future years will be classified as air carrier. This transition between the two categories is reflected in the FAA TAF. As a result, the remaining Air Taxi operations will be considered as part of general aviation in facility planning.

Before endorsing the TAF operations forecast for the master plan, the air carrier operations were compared with the air service forecast methodology presented previously. The air service scenario depicts approximately 39,246 airline operations, while the TAF depicts 41,066 by 2037, a difference of 1,820 which equates to less than three departures per day.

3.6.4. General Aviation Operations

Annual itinerant aircraft operations, those flights originating or terminating 50 miles or greater from GSP, declined by 14.89 percent annually between 2011 and 2016. Itinerant GA operations are forecasted to slightly increase over the next 20 years. Though GSP's historic trend of GA itinerant operations has followed a negative growth rate, 2017 marked a return to positive growth, increasing operations of this type by 0.32 percent CAGR. It is expected from this point forward that itinerant GA operations at GSP will grow in line with the national forecast outlined in the TAF.

Defined as operations originating or terminating within 50 miles of GSP including traffic pattern operation, local GA activity has seen variations in growth over the last 10 years. Local GA operations at GSP are projected to show zero growth which is line with the FAA TAF.

3.6.5. Military Operations

With constant changes in national security and relief needs, military operations tend to fluctuate over time. At GSP, local and itinerant military operations have followed this characteristic trend over the last 10 years. In 2016, total military operations stabilized at 2,483 total and it is forecasted that GSP will maintain this plateau of operations for the next 20 years. The FAA TAF reports zero growth in military operations at GSP. However, it is anticipated that occasional local and itinerant military operations will occur as they have in the past with the C-130 conducting the majority of these.

Table 3-16 shows the forecasted annual operations by type.

Table 3-16: Annual Operations Forecast by Type

Year	Air Carrier	Air Taxi	General Aviation			Military			Total Ops.
			Itinerant	Local	Total	Itinerant	Local	Total	
2017	20,242	14,071	7,171	350	7,521	1,715	768	2,483	44,317
2022	32,491	3,957	7,281	350	7,631	1,715	768	2,483	46,562
2027	35,445	3,808	7,393	350	7,743	1,715	768	2,483	49,479
2037	41,066	4,363	7,623	350	7,973	1,715	768	2,483	55,885
CAGR	3.79%	-5.98%	0.32%	0.00%	0.31%	0.00%	0.00%	0.00%	1.23%

Source: FAA Terminal Area Forecast, 2017

3.6.6. Aircraft Fleet Mix

As eluded to previously in Section 3.2, both commercial and general aviation aircraft are getting progressively more fuel efficient with improved engines and aerodynamic design. Engine technology will yield quieter, more fuel-efficient engines, while aircraft design may slightly change the aircraft shape, primarily in the form of increased wingspans. Table 3-17 contains a representative sample of the existing and anticipated future fleet mix for GSP. It is important to note that aircraft not yet in the market place, such as a large passenger turboprop or a new generation of regional jets is not reflected as they are not in the current manufacturer marketplace but have the potential to exist inside the 20-year horizon.

Table 3-17: Aircraft Fleet Mix

Category	Existing (2017)	Future (2037)
Commercial Service (Air Carrier)	Embraer 145	Embraer 175
	Bombardier CRJ-900	C-Series CS 110/130
	McDonnell Douglas MD-88	Boeing 737 Max-8
	Boeing 767-300F (Cargo)	Boeing 747-8F (Cargo)
	61.6%	73.5%
General Aviation Itinerant (Including Air Taxi)	Falcon 2000 LXS	Pilatus PC-12
	Cessna Citation 525	Embraer Phenom 300
	Beech Baron	Dassault Falcon 5X
	Hawker 850	Gulfstream G500
	32%	21.5%
General Aviation Local	Cessna 208 Caravan	Beech Super King Air 350
	Cessna Skyhawk (172)	Diamond DA-42
	0.8%	0.6%
Other	C-130 (Military)	C-130J (Military)
	5.6%%	4.4%

Source: McFarland Johnson, 2017

3.6.7. Peaking Characteristics – Aircraft Operations

Like the peaking characteristics used for passenger enplanements, annual operations numbers when divided equally over the year and throughout the day will not accurately identify capacity constraints or facility needs during busier periods. To accurately identify airport requirements for facility planning, peaking characteristics are broken down into the following elements:

Peak Month – The GSP passenger market is more balanced on an annual basis compared to similar sized airports. Like passenger enplanements, there is no significant peak in activity on an annual basis for commercial activity. With general aviation factored in for the overall airport operational counts, recreational activity is elevated in the summer and fall months. A review of air traffic records resulted in a peak month of approximately 9.4 percent, for consistency purposes, the same peak month metric of 9.5 percent will be used for operations (equal distribution equates to 8.3 percent).

Average Day Peak Month – The average day of the peak month (ADPM) is the industry standard measure used when planning and analyzing the airport's peaking characteristics. In the case of GSP, August is the peak month, with July and October also being above average, therefore the peak month activity is divided by 31 days.

Peak Hour – Peak hour operations is a critical metric when planning for airfield capacity. Traditionally the operational peak hour typically represents between 12 percent and 17 percent of the daily operations total. The busiest hour based on existing (October 2017) flight schedules is 13 operations (arrivals and departures) and airline operations account for 80% of total operations. The resulting 16 existing peak hour operations represents 12 percent of the daily total,

which is within the generally accepted planning range and will be applied to future year peak hour levels.

Peak operational characteristics for GSP are displayed in Table 3-18.

Table 3-18: Peak Hour Operations

	Existing	2022	2027	2037
Operations	44,632	46,562	49,479	55,885
Peak Month	4,240	4,423	4,701	5,309
Average Day Peak Month	137	143	152	171
Peak Hour	16	17	19	21

Source: McFarland Johnson, 2017

3.7. BASED AIRCRAFT

Forecasting the number and type of based aircraft is critical to planning future GA facilities, especially for the type and size of hangars and aircraft movement and parking areas. The growth elements below discuss the factors that influence the number of based aircraft at GSP

3.7.1 Growth Elements

As with operations, growth elements effecting based aircraft at GSP are expected to generally follow national trends related to general aviation fleets. The growth rates used in this forecast represent those in the most recent FAA Aerospace Forecast for 2017 to 2037. As shown in Table 3-19, piston aircraft are forecasted to follow a negative growth rate over the next 20 years while turbine aircraft will grow positively throughout the planning period. This trend is consistent with previous statements regarding fuel efficiency and aircraft technologies.

Piston – Locally, there are multiple general aviation airports that provide FBO services within GSP's ASA. Donaldson Field, Greenville Downtown, and Spartanburg Downtown Memorial Airport are each within a 30-minute drive of the Airport and totaled 329 based aircraft in 2015. The appeal and availability of GA-specific airports negatively impacts the number of based piston engine aircraft at GSP. Nationally, as the economic advantage of aircraft leasing, renting and fractional ownership becomes more popular, the number of newly purchased piston engine aircraft is decreasing in most regions. It is forecast that GSP will follow a negative trend for single and multi-engine based aircraft at a rate of -0.9 percent CAGR and -0.5 percent CAGR respectively.

Turbine – As the full owner and operator of the FBO, GSP has elevated the services available to based and transient aircraft. With this, and the national forecast for based turbine aircraft following a positive trend, it is forecasted that turbo propeller and turbo jet aircraft will increase at a rate of 2.3 percent CAGR and 1.9 percent CAGR throughout the planning period.

Table 3-19: Based Aircraft Forecast

Year	Piston			Turbine			Total Based Aircraft
	Single	Multi	Total	Turbo Prop	Turbo Jet	Total	
2017	5	6	11	4	11	15	26
2022	5	6	11	4	13	17	28
2027	4	6	10	5	14	19	29
2037	4	6	10	5	16	21	31
CAGR	-0.9%	-0.5%	-0.8%	1.4%	2.3%	1.9%	1.1%

Source: FAA National Aerospace Forecast 2017-2037

3.8. FORECAST SUMMARY

Table 3-20 presents a summary of the aviation demand forecasts developed for GSP. These forecasts are considered reasonable and achievable and will be used throughout the Master Plan Update in the development of facility requirements and the identification of alternatives.

Table 3-20 Aviation Demand Forecast Summary

	FORECAST			
	Existing	2022	2027	2037
Enplanements				
Air Carriers	1,014,611	1,182,700	1,333,823	1,648,052
Peak Hour	622	725	818	1,010
Aircraft Operations				
Air Carrier/Airline	20,242	32,491	35,445	41,066
Peak Hour	21	22	23	27
General Aviation				
GA Itinerant*	7,171	11,238	11,201	11,986
GA Local	350	350	350	350
Military	2,483	2,483	2,483	2,483
Based Aircraft				
Single	5	5	4	4
Multi	6	6	6	6
Turbo Prop	4	4	5	5
Turbo Jet	11	13	14	16

Note: GA Itinerant Operations include air taxi

Source: McFarland Johnson 2017

3.8.1. Comparison with FAA Terminal Area Forecast

To confirm validity, master plan aviation forecasts are often compared with other aviation forecasts prepared for the airport and the region. Ideally, this report's forecasts should be reasonably consistent with other forecasts of future airport activity, and compatible with forecasts for the larger region. With master plan forecasts being much more specific to the airport, it is not

unusual to see some variation from national forecasts. The most useful forecasts for comparison are those prepared by the FAA with the standard being the TAF and the national and regional forecasts previously referenced in this report. The TAF is prepared annually and includes airport forecasts for all active NPIAS airports. **Table 3-21** shows the compared results between the selected forecast and that of the FAA's TAF.

The comparison shows that the results of the Master Plan forecast are within the allowed tolerances permitted by the FAA (10 percent within 5 years; 15 percent within 10 years) and is considered reasonable for planning purposes. Facility improvements associated with passenger enplanements may want to consider construction in advance of the forecast years to avoid temporary facilities required from a short-term spike in demand.

Table 3-21: Aviation Demand Forecast vs. FAA Terminal Area Forecast

	ACTUAL	FORECAST			
	2016	2017	2022	2037	Growth
FAA TAF (2016)					
Enplanements	987,307	983,978	1,077,708	1,348,414	1.48%
Total Operations	47,315	44,317	46,562	55,885	1.23%
Master Plan Forecast					
Enplanements	987,307	1,014,611	1,182,700	1,648,052	2.46%
Total Operations	47,315	44,317	46,562	55,885	1.23%
Pct. Difference From TAF					
Enplanements	0.00%	3.11%	9.74%	22.22%	-
Total Operations	0.00%	0.00%	0.00%	0.00%	-

Source: McFarland Johnson, 2017

3.9. FUTURE DESIGN AIRCRAFT

The Runway Design Code (RDC) used in airport planning is derived from the features of the most demanding aircraft using the airport on a regular basis coupled with the best available instrument approach minimums. The first component, depicted by a letter, is the Aircraft Approach Category (AAC) and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the Airplane Design Group (ADG) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by Runway Visual Range (RVR) values. **Table 3-22** displays the RDC criteria used in airport planning.

The Boeing 767-300F combined with the similar Airbus A300-600F currently meet the critical aircraft requirement of a minimum of 500 annual itinerant operations at GSP and are classified as a D-IV aircraft. However, as cargo and air carrier traffic increases, the critical aircraft is forecast to change in the intermediate future and again in the distant future. The Boeing 747-400F, classified as D-V, is currently operating 200 to 300 operations per year at GSP and is forecast to become the design aircraft in the next five to 10 years. In the distant future, the Boeing 747-8F is anticipated to replace the Boeing 747-400F as the critical aircraft for the airport and will require D-VI design standards. **Table 3-23** presents the design details for each of these aircraft.

Table 3-22: FAA Airport Reference Code

FAA Airport Reference Code Parameters				
Category	Approach Speed	Group No.	Wing Span (ft.)	Tail Height (ft.)
	(knots)	I	< 49	< 20
A	<91	II	49 to < 79	20 to < 30
B	91 to < 121	III	79 to < 118	30 to < 45
C	121 to < 141	IV	118 to < 171	45 to < 60
D	141 to < 166	V	171 to < 214	60 to < 66
E	166 or more	VI	214 to < 262	66 to < 80

Source: FAA AC 150/5300-13A

Table 3-23: Future Design Aircraft

	Future Design Aircraft		
Aircraft Model	B767-300F	B747-400	B747-8F
Length Overall	180 ft.	232	250
Wingspan	156 ft.	213	224
Tail Height	53 ft.	64	63
Main Gear Width	30 ft. 6 in.	36 ft. 1 in.	36 ft. 1 in.
Cockpit to Main Gear	64 ft. 7 in.	84 ft. 0 in.	97 ft. 4 in.
Maximum Takeoff Weight	412,000 lbs.	875,000 lbs.	987,000 lbs.
Typical Approach Speed	145 kts.	158 kts.	159 kts.
Approach Speed Category	D	D	D
Aircraft Design Group	IV	V	VI

Source: FAA AC 150/5300-13A

3.10. LONG RANGE PLANNING

The project development process (planning, environmental, design and construction) for large scale airport improvements can often take in excess of 10 years meaning that the planning process begins long before the project objectives are necessary. While many uncertainties exist beyond the 20-year planning period, forecast results were developed for the 2045, 2055 and 2065 planning-year horizons. Facility requirements and alternatives will identify potential facility land development needs to ensure that short term development does not impede long term facility needs. Table 3-24 contains the forecast highlights for the beyond planning period horizons.

Table 3-24: Long Range Planning Forecast

	Enplanements	Air Cargo (pounds)	Operations	Based Aircraft
2045	2,153,123	302,738,694	63,895	35
2055	2,745,443	500,219,598	72,203	39
2065	3,500,708	826,520,202	81,592	44

Source: McFarland Johnson, 2017

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019

AIRPORT MASTER PLAN UPDATE

CHAPTER 4: ENVIRONMENTAL OVERVIEW

McFarland Johnson

Table of Contents

4. Environmental Overview 1
4.1. Introduction 1
4.2. Biotic Resources 2
4.2.1. Ecological Communities 2
4.2.2. Flora and Fauna 2
4.3. Water Resources 4
4.3.1. Groundwater 4
4.3.2. Wetlands 4
4.3.3. Surface Waters 8
4.3.4. Wild and Scenic Rivers 8
4.3.5. Floodplains 9
4.4. Coastal Resources 9
4.5. Department Of Transportation Section 4(F) Resources 11
4.6. Historical, Architectrual, Archaeological, and Cultural Resources 11
4.7. Farmlands 11
4.8. Land Use 12
4.9. Noise and Noise-Compatible Land Use 13
4.10. Visual Effects 16
4.10.1. Light Emissions 16
4.10.2. Visual Resources and Character 16
4.11. Air Quality 16
4.12. Hazardous Materials, Solid Waste, and Pollution Prevention 17
4.12.1. Hazardous Waste 17
4.12.2. Solid Waste 17
4.12.3. Pollution Prevention 18
4.12.4. Stormwater 18
4.13. Energy Supplies and Natural Resources 19
4.14. Climate 19
4.15. Socioeconmics, Environmental Justice, and Children's Environmental Health and Safety Risks 19
4.15.1. Socioeconomics 19
4.15.2. Environmental Justice 20
4.15.3. Children's Environmental Health and Safety Risks 21
4.16. Airport Recycling, Reuse and Waste Reduction 22
4.16.1. Existing Waste Sources 22
4.16.2. Local Recycling and Waste Management Programs 23
4.16.3. Overview of Airport Recycling, Reuse, and Waste Management Practices and Opportunities 23

List of Tables

Table 4-1 : State Listed Threatened and Endangered Species 3
Table 4-2 : Federally Listed Threatened and Endangered Species 4
Table 4-3 : Typical Outdoor Day-Night Noise Levels 13
Table 4-4 : Land Use Compatibility 14
Table 4-5 : Waste Sources and Control 23

List of Figures

Figure 4-1 : National Wetland Inventory Map 6
Figure 4-2 : Preferred Wetland Mitigation Option Hierarchy 7
Figure 4-3 : FEMA Floodplain Map 10
Figure 4-4 : Noise Contour Map 15
Figure 4-5 : Demographic Profile Comparison Graph 21

4. Environmental Overview

4.1. INTRODUCTION

The operation and development of an airport has the potential to affect neighboring land-uses and natural and human environments, which are of fundamental concern in the airport planning process. Therefore, it is imperative to identify the resources and potential impacts to the environment and surrounding community during the initial stages of the planning process. This allows airport planners and engineers to incorporate measures in accordance with federal, state, and local rules and regulations to avoid, minimize, or mitigate potential impacts to the environment.

The National Environmental Policy Act (NEPA) of 1969 requires that all federal agencies consider the potential impacts their projects and policies have on the environment. The Federal Aviation Administration (FAA), an agency of the United States Department of Transportation (USDOT), has issued Order 1050.1F, *Environmental Impacts: Policies and Procedures* (effective date July 17, 2015), which ensures all FAA actions comply with NEPA. The FAA has also issued Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (effective date April 28, 2006). FAA Order 5050.4B guides NEPA compliance specifically for major federal actions at public-use airports.

FAA Orders 1050.1F and 5050.4B identify environmental categories that must be considered in relation to a proposed action to determine whether a significant impact would result and determine what actions would be appropriate to avoid or minimize an impact's effect. FAA Order 1050.1F specifies the threshold of significance for each of the categories addressed.

The following is a list of environmental impact categories, identified in Order 1050.1F, that may be relevant to FAA actions:

- Biotic resources (including fish, wildlife, and plants)
- Water resources (including wetlands, surface waters, wild and scenic rivers, floodplains, and groundwater)
- Coastal resources
- Department of Transportation Act, Section 4(f) Resources
- Historical, architectural, archeological, and cultural resources
- Farmlands
- Land use
- Noise and noise-compatible land use
- Visual effects (including light emissions)
- Air quality
- Hazardous materials, solid waste, and pollution prevention
- Energy supplies and natural resources
- Climate
- Socioeconomics, environmental justice, and children's environmental health and safety risks

This chapter provides a summary of the environmental conditions and constraints at the Greenville-Spartanburg International Airport. The information provided in this chapter will be carefully considered as part of the Alternatives Analysis that will be completed for this Master Plan Update (MPU). Future airport development proposed in this MPU will be reviewed in further detail in the subsequent environmental documentation to satisfy the requirements of NEPA. The information provided in this chapter is based on information obtained from the Airport and appropriate federal, state, and local agencies.

4.2. BIOTIC RESOURCES

Biotic resources refer to the various types of flora (plants) and fauna (fish, birds, reptiles, amphibians, mammals, etc.), including state and federally listed threatened and endangered species, in a particular area. It also encompasses the habitats supporting the various flora and fauna including rivers, lakes, wetlands, forests, and other ecological communities. Airport projects can affect these ecological communities and thereby affect vegetation and wildlife populations.

4.2.1. Ecological Communities

Most of the Airport and adjacent areas have been disturbed by airport and commercial development, and current and past agricultural and forestry operations. The major ecological community cover types on Airport property consist of maintained grassland, pine plantation, mixed forest, and paved/ gravel surfaces. All habitats identified at the Airport are common and secure within the region.

There are no habitats located on the site that are designated as “critical habitat” for any state or federally listed threatened or endangered species, or species of special concern. State or federally listed threatened or endangered species or species of special concern are discussed in Section 4.2.2.1. Further information regarding state and federally regulated waterways and wetlands is presented in Sections 4.3.2 and 4.3.3.

4.2.2. Flora and Fauna

Based on a review of the Airport’s 2009-2010 Wildlife Hazard Assessment (WHA), the maintained grasslands that comprise the majority of the Airport’s air operations area (AOA) are dominated by warm season grasses such as bermudagrass (*Cynodon dactylon*), ticklegrass (*Panicum capillare*), Johnsongrass (*Sorghum halepense*), purpletop (*Tridens flavus*), and goosegrass (*Eleusine indica*). The WHA also indicated that the most common bird species utilizing the Airport’s AOA were American crow (*Corvus brachyrhynchos*), European starling (*Sturnus vulgaris*), eastern meadowlark (*Sturnella magna*), mourning dove (*Zenaida macroura*), and killdeer (*Charadrius vociferus*), while observed mammals within the AOA included raccoon (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), and coyote (*Canis latrans*).

Information on potential rare, threatened, and endangered species on, or in the vicinity of, the Airport is provided in the following sub-section.

4.2.2.1. Threatened and Endangered Species

The Endangered Species Act (ESA) directs all federal agencies to work to conserve federally listed endangered and threatened species and to use their authorities to further the purposes of the ESA. Section 7 of the ESA, titled "*Interagency Cooperation*," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any federally listed species. Endangered species are those which are in danger of extinction throughout their range or a significant portion of its range. Threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Candidate species are species for which the United States Fish and Wildlife Service (USFWS) has sufficient information on the biological vulnerability and threats to support issuance of a proposal list, but issuance of a proposed rule is currently precluded by higher priority listing actions. Candidate species do not receive substantive or procedural protection under the ESA. However, USFWS does encourage federal agencies and other appropriate parties to consider these species in the planning process.

South Carolina's threatened and endangered species program protects all federally listed threatened and endangered species as well as state listed threatened and endangered species. The South Carolina Department of Natural Resources (SCDNR) is the state agency primarily responsibility for administering the State's threatened and endangered species program under South Carolina Code of State Regulations Section 123-150: Non-Game and Endangered Species and South Carolina Code of Laws Title 50, Chapter 15: Nongame and Endangered Species. Under current South Carolina law and regulations, state level designations of threatened and endangered species are limited to "non-game species", which are defined as: "*…any wild mammal, bird, amphibian, reptile, fish, mollusk, crustacean, or other wild animal not otherwise legally classified by statute or regulation of this State as a game species*". There are no current state laws or regulatory provisions to protect rare plants or ecological communities.

McFarland Johnson conducted a review of SCDNR's website regarding county level distribution of state listed threatened or endangered species on October 29, 2017. The list, as shown in **Table 4-1**, indicated several state listed threatened or endangered species known to occur within Greenville County, no species were listed for Spartanburg County.

An official species list from the USFWS was obtained on October 9, 2017 and is also included in **Appendix A**. The list, as shown in **Table 4-2**, indicates that there are several listed species under the ESA within the vicinity of the Airport. The correspondence also indicated that there are no critical habitats within the project area (Airport property).

Table 4-1: State Listed Threatened and Endangered Species

Common Name	Scientific Name	State Status
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*	Endangered
American Peregrine Falcon	*Falco peregrinus anatum*	Threatened
Bog Turtle	*Glyptemys muhlenbergii*	Threatened
Eastern Small-footed Myotis	*Myotis leibii*	Threatened

*Source: SCDNR (*http://www.dnr.sc.gov/species/county.html*)*

Table 4-2: Federally Listed Threatened and Endangered Species

Common Name	Scientific Name	Federal Status
Northern Long-Eared Bat	*Myotis septentrionalis*	Threatened
Bog Turtle	*Clemmys muhlenbergii*	Threatened
Bunched Arrowhead	*Sagittaria fasciculata*	Endangered
Dwarf-flowered Heartleaf	*Hexastylis naniflora*	Threatened
Mountain Sweet Pitcher-plant	*Sarracenia rubra ssp. jonesii*	Endangered
Small Whorled Pogonia	*Isotria medeoloides*	Threatened
Swamp Pink	*Helonias bullata*	Threatened
White Fringeless Orchid	*Platanthera integrilabia*	Threatened
White Irisette	*Sisyrinchium dichotomum*	Endangered
Rock Gnome Lichen	*Gymnoderma lineare*	Endangered

Source: USFWS Official Species List- Consultation Code: 04ES1000-2018-SLI-0030

As specific Airport development alternatives are identified and considered, the potential to affect State or federally listed rare, threatened, and endangered species will be re-assessed on an individual basis and in consultation with the SCDNR, USFWS, and FAA.

4.3. WATER RESOURCES

This section discusses potential affects to water resources including groundwater, wetlands, surface waters (streams, rivers, ponds, and lakes), and floodplains.

4.3.1. Groundwater

Groundwater serves as an important potable water supply for many individual households, small communities, and larger municipalities. Potential impacts from airport development projects can include reduced groundwater recharge and potential contamination through chemical, toxin, or other pollutant releases.

The Environmental Protection Agency (EPA) Sole Source Aquifer (SSA) program was established under the Safe Drinking Water Act (SDWA). According to the EPA, a SSA is defined as one that supplies at least 50 percent of the drinking water for its service area, and wherein which there is no reasonably available alternative drinking water sources should the aquifer become contaminated. The SSA program allows for EPA review of federally funded projects that have the potential to affect designated SSAs and their source areas.

According to the EPA, Airport property is not located over a SSA and therefore potential projects are not subject to EPA Section 1424(e) of the Safe Drinking Water Act. However, future proposed projects will take measures in design and construction to avoid, minimize, or mitigate any possible adverse impacts to groundwater.

4.3.2. Wetlands

The United States Army Corps of Engineers (USACE) regulates activities in wetlands that have a significant nexus to Traditional Navigable Waters of the United States (TNWs) under Section 404

of the Clean Water Act (CWA). The USACE requires that an area have hydrophytic vegetation primacy, hydric soils, and wetland hydrology present in order to be considered a wetland.

South Carolina has no current regulatory provisions to provide for wetland protection, however Section 401 of the CWA provides states with the authority to ensure that federal agencies do not issue permits or licenses that violate their water quality standards. The South Carolina Department of Health and Environmental Control (DHEC) implements Section 401 compliance through a certification process called Water Quality Certification (WQC). Through the DHEC WQC regulations, permittees must demonstrate avoidance and minimization of potential wetland impacts, and provided for mitigation for unavoidable wetland impacts.

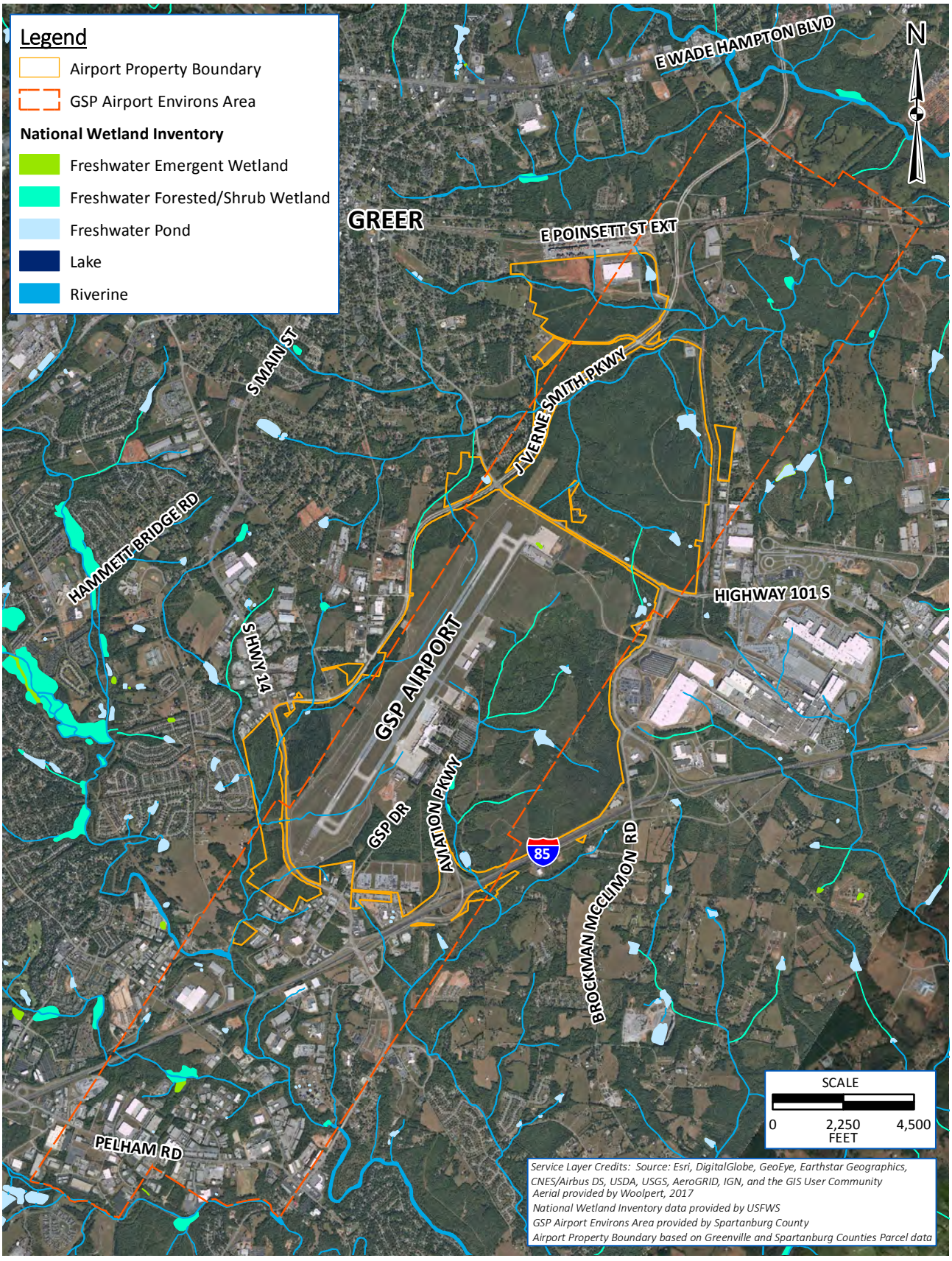
In addition, Executive Order (EO) 11990 - *Protection of Wetlands*, states that federal agencies shall provide leadership and shall take action to the destruction, loss, or degradation of wetlands, and to preserve and enhance natural and beneficial values of wetlands in carrying out the agency's responsibilities. Under EO 11990, wetlands are defined as those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

National Wetlands Inventory (NWI) mapping prepared by the USFWS indicated the potential for several small forested wetlands, freshwater ponds and streams to exist on Airport property. NWI mapping does not have any regulatory consequence, but rather indicates areas that may meet federal wetland criteria as identified by the USFWS using aerial photography. NWI mapping of Airport owned property is shown as Figure 4-1.

Future proposed projects will take measures in design and construction to avoid, minimize, or mitigate any possible adverse impacts to wetland resources to the degree possible. The use of Best Management Practices (BMPs) during construction projects will minimize indirect impacts to wetland resources. Projects that have no practicable alternatives to avoid direct impacts to federally regulated wetlands will require a Section 404 permit from the USACE and Section 401 WQC from the DHEC. In addition, when impacts to wetlands cannot be avoided, an EO 11990 "Wetland Finding" must be prepared to document compliance with the order and that the wetland impacts are justified.

Compensatory wetland mitigation may be required as a permit condition depending on the specific details of the proposed project(s). Mitigation is required by the USACE when impacts to federally regulated wetlands exceed 0.10 acres. Wetland mitigation can come in the form of restoration, establishment, enhancement, and/or preservation of wetlands.

Figure 4-1: National Wetland Inventory Map



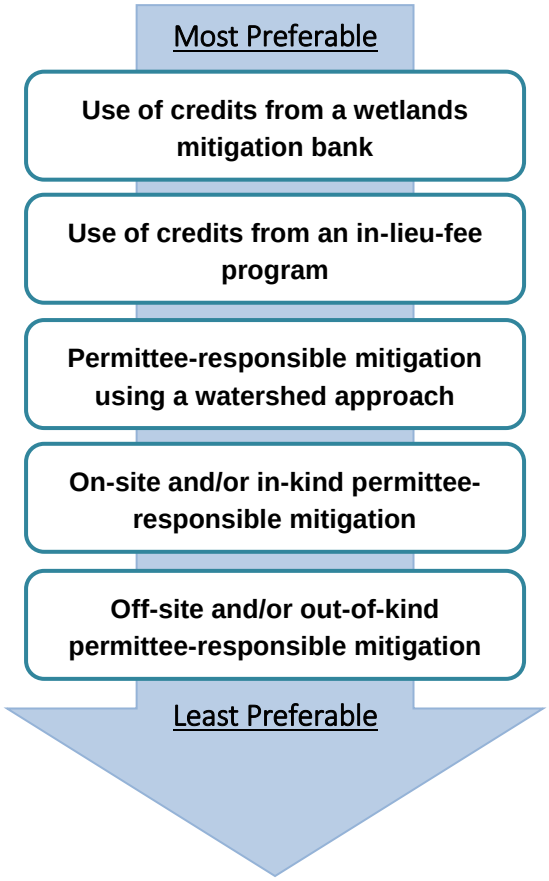
Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\4-1 NWI.mxd

Based on regulations promulgated by the Department of Defense and Environmental Protection Agency in *Mitigation for Losses of Aquatic Resources; Final Rule* (Fed. Reg. Vol. 73, No. 70, April 10, 2008) a graphic presenting the hierarchy of preferred wetland mitigation options for impacts to federally regulated wetlands is presented as Figure 4-2.

The USACE Charleston District has established a method to calculate the number of mitigation credits required to offset adverse impacts to aquatic resources and the number of mitigation credits generated by a compensatory mitigation plan. The most current method is presented in the Charleston District's *Compensatory Mitigation Guidelines*, last revised on October 7, 2010[1].

Five federal agencies, including the FAA and USACE, signed a Memorandum of Agreement (MOA) in July 2003 to facilitate interagency cooperation on aircraft-wildlife strikes related issues, including wetland management at airports. As part of the MOA, the signatory agencies are required to diligently consider the siting criteria recommendations as stated in FAA Advisory Circular (AC) 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*.

Figure 4-2: Preferred Wetland Mitigation Option Hierarchy


Most Preferable
Use of credits from a wetlands mitigation bank
Use of credits from an in-lieu-fee program
Permittee-responsible mitigation using a watershed approach
On-site and/or in-kind permittee-responsible mitigation
Off-site and/or out-of-kind permittee-responsible mitigation
Least Preferable

[1] *http://www.sac.usace.army.mil/Missions/Regulatory/Compensatory-Mitigation*

FAA AC 150/5200-33B recommends separation distances between the AOA and potential wildlife hazards, including proposed wetland mitigation sites. These siting distances are:

- 5,000 feet of a runway that serves piston-powered aircraft
- 10,000 feet of a runway that serves turbine-powered aircraft
- 5 statute miles if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace

The above siting criteria will also be taken into consideration when considering potential wetland mitigation options and site selection.

4.3.3. Surface Waters

The USACE regulates surface waters under Section 10 of the Rivers and Harbors Appropriation Act (RHA) that are considered to be a TNW as defined specifically there within. The USACE also regulates surface water bodies through Section 404 of the CWA that have a significant nexus to a TNW as defined in Section 10 of the RHA or a TNW as defined Section 404 of the CWA. A significant nexus is generally defined as having more than an insubstantial or speculative effect on the chemical, physical, or biological integrity of a downstream TNW. Surficial open waterbodies, including streams, ponds, and lakes, are delineated by their Ordinary High Water Mark (OHWM) as defined in Title 33, Code of Federal Regulations, Part 328 (33 CFR 328).

South Carolina's primary regulatory provision to provide for surface water protection is through Section 401 of the CWA which provides states with the authority to ensure that federal agencies do not issue permits or licenses that violate their water quality standards. The DHEC implements Section 401 compliance through a WQC. Through the DHEC WQC regulations, permittees must demonstrate avoidance and minimization of potential impacts to surface waters, and provide for mitigation for unavoidable impacts.

Future proposed projects will take measures in design and construction to avoid, minimize, or mitigate any possible adverse impacts to surface water resources to the degree possible. The use of BMPs during construction project will minimize indirect impacts to wetland resources. Projects that have no practicable alternatives to avoid direct impacts to federally regulated surface waters will require a Section 404 permit from the USACE and Section 401 WQC from the DHEC.

4.3.4. Wild and Scenic Rivers

The National Wild and Scenic Rivers Act (Public Law 90-542) provides protection for several of the nation's free-flowing rivers that exhibit exceptional natural, cultural, and recreational values.

The South Carolina Scenic Rivers Act of 1989 (South Carolina Code of Laws Title 49-Chapter 29, as amended) provides for protection of selected rivers and river segments within the state that possess unique or outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic, or cultural values.

There are no state or federally designated wild, scenic, or recreational rivers on or adjacent to Airport property.

4.3.5. Floodplains

Floodplains are low lying land areas typically associated with bodies of water that are likely to become inundated during a flooding event. Floodplains serve an important function in retaining storm waters to protect against downstream flooding, property damage, and potential loss of life.

EO 11988, *Floodplain Management,* directs all federal agencies to avoid the direct and indirect support of floodplain development wherever there is a practicable alternative.

The area or magnitude of a floodplain will vary according to the magnitude of the storm event as determined by the storm interval occurrences. For example, a five-year storm has a magnitude that can be expected once every five years. FEMA utilizes a 100-year storm interval for flood preparation. Flooding related to a 100-year storm statistically has a one-percent chance of occurring during any given year. The 100-year period has been selected as having special significance for floodplain management because it is the maximum level of flooding that can reasonably be expected and planned for during a project's expected life span.

According to the most current FEMA Flood Insurance Rate Maps (FIRM), portions of Airport property are mapped within a designated 100-year floodplain area. Figure 4-3, FEMA Floodplain Map, shows the location of flood zones on and near the Airport.

As specific Airport developments are identified, and analyzed as part of this MPU and through future NEPA documentation requirements, their potential to encroach upon a FEMA designated floodplains will be evaluated.

4.4. COASTAL RESOURCES

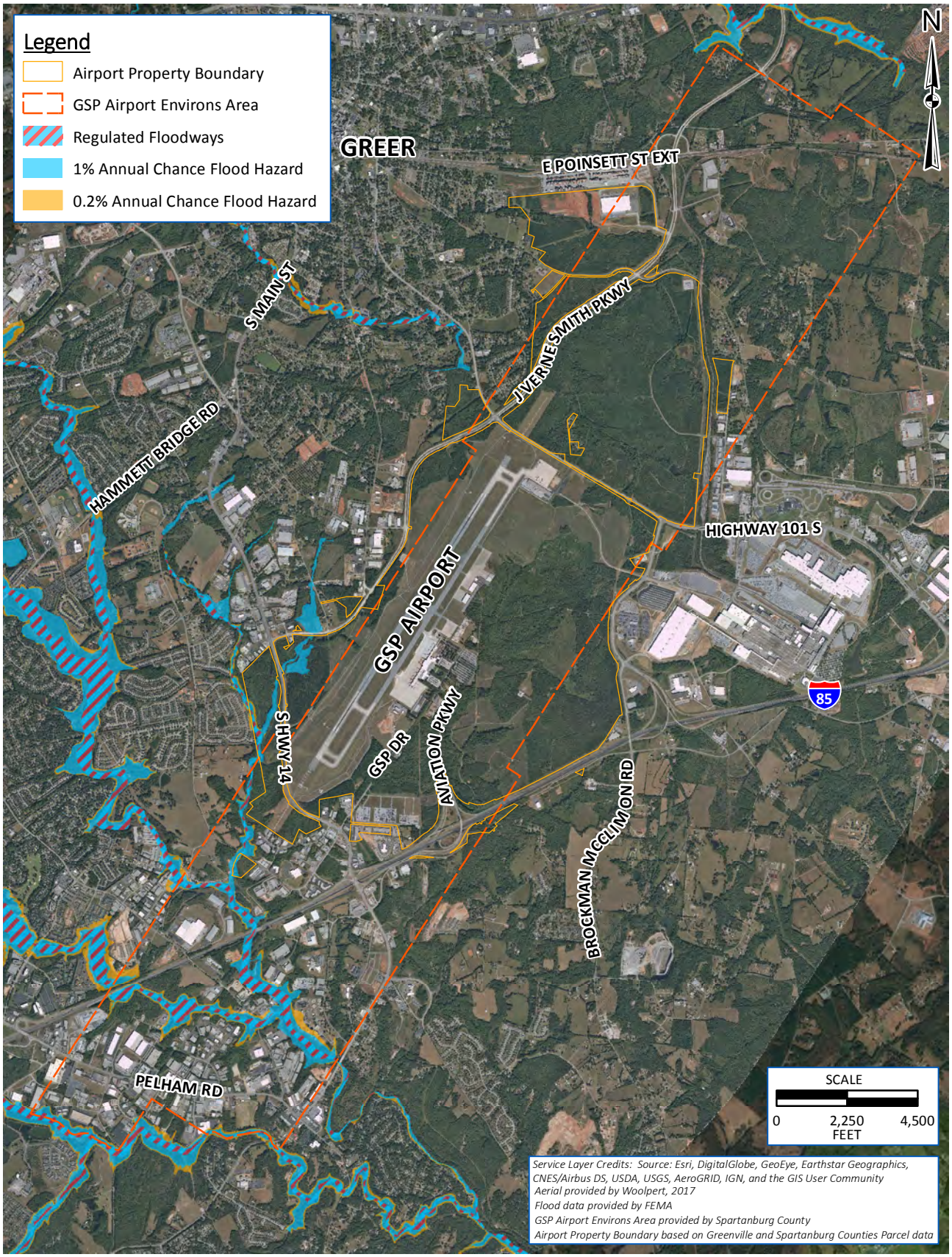
The federal Coastal Barrier Resources Act (CBRA) provides for review of federally funded projects undertaken within the Coastal Barrier Resources System (CBRS). The CBRS contains undeveloped coastal barriers along the coasts of the Atlantic Ocean, Gulf of Mexico, and Great Lakes.

The Airport is not located within a CBRS and the CBRA will not apply to any proposed improvements at the Airport.

The Coastal Zone Management Act (CZMA) is a federal program that provides for management and protection of all of the nation's ocean and Great Lakes coasts. In South Carolina, the management authority has been delegated to the DHEC's Office of Ocean and Coastal Resource Management. Under South Carolina's Coastal Management Program (CMP), the DHEC develops coastal policies and establishes state consistency requirements.

The Airport is not located within or adjacent a designated coastal zone, and the provisions of the CZMA will not apply to any proposed improvements at the Airport.

Figure 4-3: FEMA Floodplain Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\4-3 FEMA.mxd

4.5. DEPARTMENT OF TRANSPORTATION SECTION 4(F) RESOURCES

Section 4(f) of the Department of Transportation Act of 1966 protects publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites of national, state, or local significance from development unless there are no feasible alternatives.

There are no publicly owned parks, recreation areas, or wildlife and waterfowl refuges on or immediately adjacent to Airport property.

A review of the South Carolina State Historic Preservation Office (SHPO) online cultural resource geographic information system (ArchSite), conducted on October 9, 2017, did not indicate the presence of known historic properties listed in or eligible for listing in the National Register of Historic Places on Airport property.

An impact to historic sites of national, state, or local significance on or near the Airport may be considered a use under Section 4(f). As specific developments are identified, and analyzed as part of this MPU and through future NEPA documentation requirements, their potential to effect historic resources or other resources protected under Section 4(f) will be assessed on an individual basis.

4.6. HISTORICAL, ARCHITECTRUAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

According to 36 CFR Part 800, a historic property is "any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NHRP)". Section 106 of The National Historic Preservation Act (NHPA) requires that federal agencies, such as the FAA, consider the effects of their actions on historic properties via consultation with SHPO.

As previously mentioned, review of the SHPO ArchSite did not indicate the presence of known historic properties listed in or eligible for listing in the National Register of Historic Places on Airport property.

When a specific airport development is proposed, the required documentation, including detailed descriptions and pictures of structures to be affected, will be sent to SHPO for a determination of that project's potential effect on historic or cultural resources as part of future studies to comply with NEPA.

4.7. FARMLANDS

The Farmland Protection Policy Act (FPPA), 7 CFR Part 658, requires federal agencies to consider project alternatives that will minimize unnecessary and irreversible conversion of farmland to nonagricultural uses. For the purposes of the FPPA, farmland refers to soils classified as prime farmland, unique farmland, and farmland of statewide or local importance.

According to the U.S. Natural Resource Conservation Service (NRCS) *Web Soil Survey,* accessed on October 11, 2017, approximately 29.9 percent (1065.4 acres) of Airport property is classified as prime farmland and 20.5 percent (731.6 acres) is classified as Farmland of Statewide Importance. An additional 4.7 percent (167.2 acres) is classified as prime farmland if drained and either protected from flooding or not frequently flooded during the growing season.

The FPPA does not apply to land already committed to urban development. Airport property has already been previously committed to urban development or current airport utilization and development and would not be subject to the FPPA regulations.

There are no local municipality zoned agricultural areas near the Airport.

4.8. LAND USE

When considering improvement projects that meet an airport's development goals, it is important early in the planning process to identify potential impacts to existing land uses on airport property and in the surrounding area and to determine how potential airport projects will affect future land use and development patterns. This will enable the project to incorporate measures into the future design and layout of airport developments that will avoid or minimize land use conflicts as well as improve on existing conflicts when practicable.

Some land uses that are considered more susceptible to impacts from airport development include, but are not limited to, residential areas, public schools, religious institutions, hospitals, and certain public places such as parks, recreational areas, and cemeteries, where quiet is an expected part of the user experience.

The area surrounding the Airport is mostly residential to the north- and southwest with some intermitted industrial and institutional land use to the direct west and the southeast. A small amount of commercial land is located to the southeast as well. The area to east of the Airport, consists predominately of undeveloped lands.

There are currently no parks, public schools, religious institutions, hospitals, or cemeteries located adjacent the Airport. However, there are adjacent residential properties, as well as several parks, religious institutions, hospitals and schools located in the vicinity of the Airport that may be considered noise sensitive.

Alternatively, there are some land uses that can negatively impact the operation of the Airport and are considered incompatible with Airport activity. These land uses can include park and recreational areas, golf courses, landfills, open water areas, and other land uses that have the potential to serve as wildlife attractants, and commercial and industrial facilities that generate high-voltage electricity, utilize bright lights, or create a significant amount of glare, smoke, or steam.

FAA AC 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near airports. Potential wildlife attractants and congregation areas can include areas such as shopping malls, agricultural fields, livestock operations, golf courses, parks, waste handling facilities, waterbodies, wetlands, and water management facilities.

The Greenville-Spartanburg Airport Environs Commission has established the *Greenville-Spartanburg Airport Environs Area Zoning Ordinance*, to manage airport hazards and incompatible uses of land within the vicinity of the Airport. Specific information regarding this zoning ordinance was previously presented in Section 2.6.2.

As future improvements are considered as part of this MPU, the presence of incompatible land uses within the vicinity of the Airport will be considered.

4.9. NOISE AND NOISE-COMPATIBLE LAND USE

Aircraft noise emissions, inherent to the operation of an airport, can adversely impact land use compatibility between an airport and surrounding properties, particularly in the presence of noise-sensitive receptors. Churches, hospitals, schools, amphitheaters, and residential districts are receptors that are sensitive to elevated noise levels. Recreational areas and some commercial uses are moderately sensitive to elevated noise levels. Therefore, it is important to predict any change in noise levels associated with airport development, to determine the significance, if any, of the impact to noise sensitive land-uses. Then, abatement measures can be incorporated into airport development plans to avoid or minimize the impacts.

In order to evaluate the noise impacts of aviation activity on surrounding areas, the FAA has developed the Aviation Environmental Design Tool (AEDT), Version 2C. The noise modeling component within AEDT identifies locations that are exposed to specific levels of aircraft-generated noise and is based on algorithms which use aircraft specific data to estimate noise accounting for specific operation mode, thrust setting, and source-receiver geometry, acoustic directivity and other environmental factors. Inputs into AEDT can include aviation activity forecasts and runway configurations for various scenarios, as well as terrain and weather information. This computer model calculates cumulative aircraft noise at ground level expressed in decibels (dB), using the Day-Night Average Level (DNL). The DNL is the yearly day-night average sound level. All operations that occur between 10:00 pm and 6:59 am, also known as nighttime operations, incur an additional 10 dB weight within the model. Decibels are measured in A-weighted units, which approximate the range of human hearing. The FAA considers the 65 dB DNL level to be the threshold of impact for noise-sensitive areas. In order to help put the 65 dB DNL into perspective, the typical ambient noise level in suburban residential areas is 55 dB DNL. Table 4-3 shows the typical noise levels associated with specific areas commonly encountered every day. Table 4-4 presents the day-night average noise levels (DNL, dB), that are used by the FAA to evaluate land use compatibility with respect to airports.

Table 4-3: Typical Outdoor Day-Night Noise Levels

DNL Day-Night Noise Level (dB)	Location
50 dB	Small town residential area or quiet suburban area
55 dB	Suburban residential area
60 dB	Urban residential
65 dB	Noisy urban residential area
70 dB	Very noisy urban residential area
80 dB	City Noise (Downtown of a Major Metropolitan Area)
80 dB	3rd Floor Apartment in a Major City Next to a Freeway

Source: Noise Fundamentals Training Document, Highway Noise Fundamentals, U.S. Department of Transportation, Federal Highway Administration

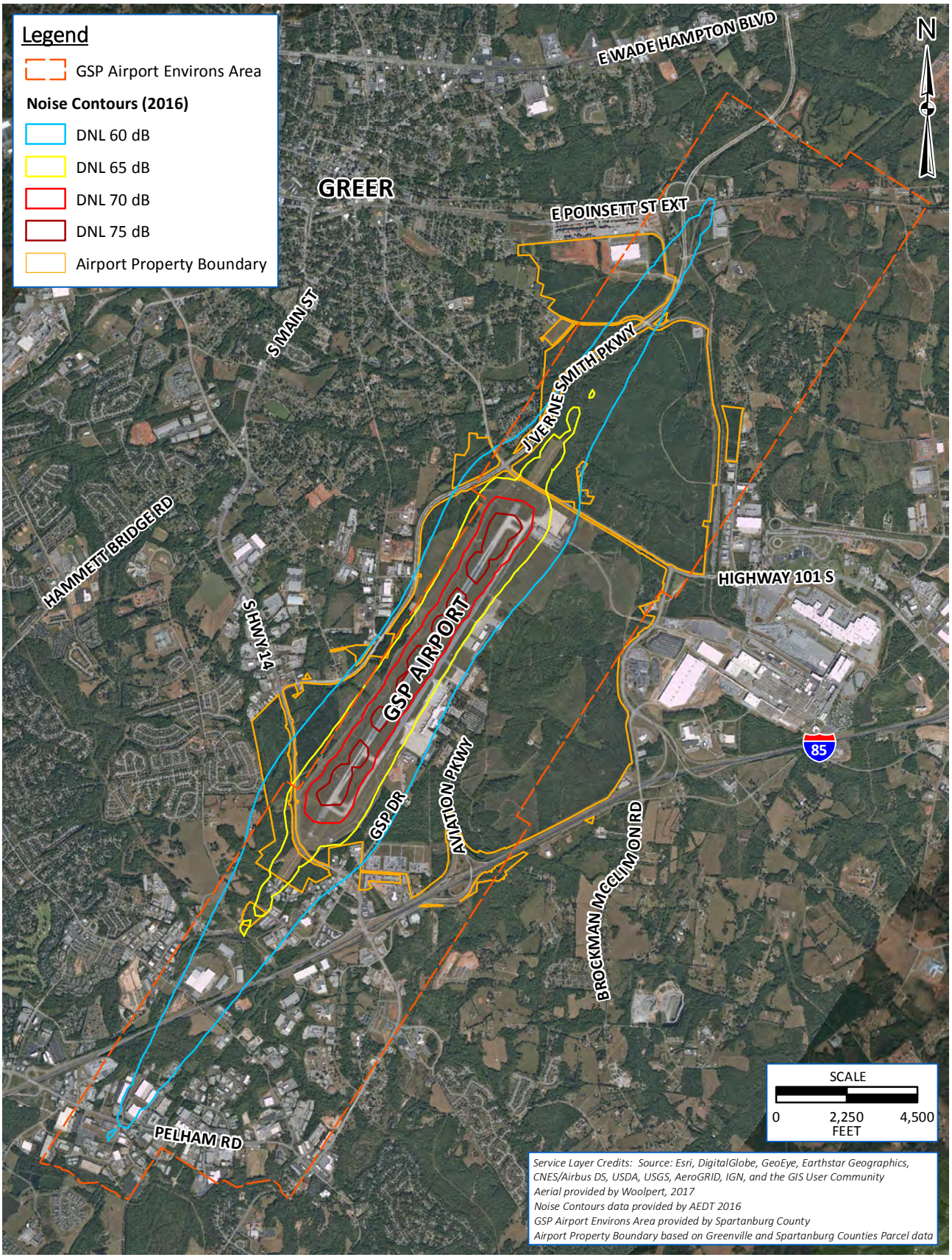
Table 4-4: Land Use Compatibility

Land Use	Yearly Day-Night Average Noise Level (DNL, dB)		
	Compatible Below 65	Compatible Between 65 and 70	Compatible Between 70 and 75
Residential	YES	NO*	NO*
Mobile Home Parks	YES	NO	NO
Transient Lodgings	YES	NO*	NO*
Schools	YES	NO*	NO*
Hospitals/Nursing Homes	YES	YES*	YES*
Churches/Auditoriums	YES	YES*	YES*
Governmental Services	YES	YES	YES*
Transportation/Parking	YES	YES*	YES*
Offices/Business/Professional	YES	YES	YES*
Wholesale and Retail	YES	YES	YES*
Utilities	YES	YES	YES*
Communications	YES	YES	YES*
Manufacturing	YES	YES	YES*
Photographic/Optical	YES	YES	YES*
Agriculture and Forestry	YES	YES*	YES*
Livestock Farming	YES	YES*	YES*
Mining/Fishing	YES	YES	YES
Outdoor Sports Arenas	YES	YES*	YES*
Outdoor Music Shells	YES	NO	NO
Nature Exhibits/Zoos	YES	YES	NO
Amusements/Parks/Camps	YES	YES	YES
Golf Courses/Stables	YES	YES	YES*

Source: 14 CFR 150, Airport Noise Compatibility Planning
**Measures must be incorporated into the design of the structure or use that will allow this activity to continue at the indicated noise exposure level*

A review of aerial photography, along with land use maps of the area, indicates that much of the land surrounding the Airport to the east, south, and west, would not be considered noise sensitive, as much of these lands are vacant, categorized as agricultural land use, or are developed with commercial uses. There are several noise sensitive land uses, primarily residences, located in the vicinity of the Airport, including Chartwell Estates and Chartwell Townhomes west of the Runway 4 approach end and the Maplewood subdivision north of the Runway 22 approach end. **Figure 4-4** displays the 2016 Noise Contours Map.

Figure 4-4: Noise Contour Map



Document Path: K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\GIS\4-4 Noise.mxd

A noise analysis will be completed as part of the Land Use Plan included in the Airport Layout Plan (ALP) set. This analysis will include the forecasted number of future operations and will utilize a fleet mix anticipated to occur at the Airport, and will be based on the final infrastructure improvements recommended as part of this MPU. The Land Use Plan will identify land uses of adjacent properties and the noise contours generated will be utilized to identify any potential impacts associated with the proposed development.

4.10. VISUAL EFFECTS

A visual effect refers to the potential effects due to light emissions, as well as the potential effects to visual resources and character.

4.10.1. Light Emissions

Airport improvements may include the installation of additional lighting or change the location of lighting on airport property to accommodate the construction of the infrastructure improvements. These installations can alter the existing lighting conditions both on-airport and in the vicinity of an airport. Light emissions are typically one of the greatest concerns for residents in neighborhoods, as well as users of other incompatible land uses, adjacent to an airport that could be directly impacted by a change in lighting.

Further analysis will be required during the NEPA evaluation process to ensure that potential light emission effects of Airport development projects do not significantly negatively effects adjacent landowners.

4.10.2. Visual Resources and Character

The Airport is located within an area of undeveloped land, light commercial land uses, and residential development. There are no buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics in the vicinity of the Airport. Any potential development at the Airport would be in character with the existing surrounding area land uses and would not negatively affect the visual character of the surrounding area.

4.11. AIR QUALITY

An increase in vehicle exhaust emissions, caused by development related increases in aircraft activity and automobile traffic, may affect air quality. However, the air quality impact attributable to potential development is expected to be negligible at the Airport.

Under Section 176(c) of the Clean Air Act (CAA) Amendments of 1977, the FAA is responsible for ensuring that federal airport actions conform to the State Implementation Plan (SIP), which protects against regional air pollution impacts. The criteria and procedures for implementing this conformity are detailed in Title 40 CFR, Part 93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans.* Many federal actions on an airport are considered to be general conformity actions. Presently, the general conformity rules only apply in areas that have been determined by the United States EPA to be in nonattainment or maintenance for the CAA's National Ambient Air Quality Standards (NAAQS) of the six priority pollutants (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead). Under NEPA, the FAA

may be required to prepare detailed air quality analysis for proposed projects whose air quality emissions have the potential to cause violations of the NAAQS for the six criteria pollutants.

The EPA does not currently list Greenville County or Spartanburg County as areas of nonattainment or maintenance for NAAQS. Most Airport projects will not cause or create a reasonably foreseeable emission increase, which can be sufficiently documented and disclosed through a qualitative air quality assessment to satisfy the requirements of the CAA and NEPA. If large scale projects are proposed that may create an increase in emissions, a full emissions inventory will be required.

4.12. HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

4.12.1. Hazardous Waste

A Hazardous Waste/Contaminated Material (HWCM) desktop screening was conducted to determine the potential for the presence of HWCM on or near Airport property. The screening involved the review of online governmental databases and the Environmental Radius Database Report provided by NETROnline Environmental Database Network. An environmental regulatory agency records review of this nature is based on publicly available information from state and federal agencies.

Review of the USEPA Envirofacts Database did not indicate the potential for the release of chemical, hazardous, or petroleum materials at or in the immediate vicinity of the Airport. The Environmental Radius Database Report indicated two records of leaking underground storage tanks associated with Stevens Aviation, Inc., located at 2100 GSP Drive.

It is possible that there were incidents on or near the Airport property involving chemical, hazardous, or petroleum related materials that were not reported. If previously unidentified chemical, hazardous, or petroleum related wastes are encountered during the construction of any future proposed projects, direct consultation will occur with the DHEC and the wastes will be handled and disposed of in accordance with all applicable federal, state, and local regulations.

4.12.2. Solid Waste

Currently, the Airport has a solid waste collection and disposal services contract with Waste Connections of the Carolinas, a local waste management company located in Duncan, South Carolina. All municipal solid waste is transported approximately 26 miles southwest to the Anderson Regional Landfill, a RCRA Subtitle “D” landfill, located in Belton, South Carolina. The Anderson Regional Landfill is also owned and operated by the Waste Connections of the Carolinas. The Anderson Regional Landfill is permitted to accept municipal solid waste, industrial solid waste, sewage sludge, nonhazardous municipal solid waste incinerator ash, and other nonhazardous waste.

According to the South Carolina Solid Waste Management Annual Report for Fiscal Year 2016, the Anderson Regional Landfill has a permitted annual intake limit of 438,000 tons per year, with an estimated 6,241,144 tons of remaining capacity. Based the permitted annual intake limit, the anticipated life span of the landfill is approximately 14.2 years, while based on the 2016 intake (347,828 tons), the estimated life span of the landfill is 17.9 years. Based on the permitted landfill

capacity and estimated landfill life span, adequate space for the disposal of solid waste attributable to any Airport development is available.

4.12.3. Pollution Prevention

The Clean Water Act authorizes the EPA and states, which are delegated the authority by EPA, to regulate point sources that discharge pollutants into waters of the United States through the National Pollutant Discharge Elimination System (NPDES) permit program. So-called "point sources" are generated from a variety of municipal and industrial operations, including treated wastewater, process water, cooling water, and stormwater runoff from drainage systems. In South Carolina, the NPDES program is delegated to DHEC. See Section 4.12.4 for further information specific to stormwater discharges.

Although the DHEC does not regulate AST systems, it does regulate underground storage tanks (USTs) for the entire life of the tank system under the Underground Storage Tank Control Regulations (R.61-92).

The Airport operates a fueling facility through its fixed-base operator (FBO) to the east of the airfield near the intersection of GSP Drive and Stevens Road. The farm contains five 30,000-gallon USTs of Jet A fuel and one 12,000-gallon UST of Avgas. All tanks have a 95 percent max capacity level with high level auto switch off controls at 95 percent and high-level alarms at 90 percent. All fuel trucks that refill at the storage facility have three separate high level shut off systems to prevent overfill including a Scully System. The np is responsible for compliance with all applicable local, state and federal petroleum bulk storage requirements in order to minimize the potential for spills.

4.12.4. Stormwater

Airport development projects may potentially affect surface and groundwater quality. The implementation of stormwater management measures, designed to avoid or minimize the impacts to water quality during a project's construction and operation phase, is required for many types of development projects. The specific stormwater management measures required are dependent upon the magnitude of the impact.

The DHEC issues NPDES Construction General Permits (CGP) under the statutory and regulatory provisions of the South Carolina Pollution Control Act (S.C. Code Sections 48-1-10) and South Carolina Stormwater Management and Sediment Reduction Regulations (R.72-300).

In general, automatic permit coverage under the NPDES CGP applies to sites that comprise 0.5 acres and less of land disturbance, are not part of a larger common plan, and drain within 0.5 miles of a coastal receiving water. For all other projects not meeting these conditions, an Individual NPDES or General NPDES Permit for Stormwater Construction Activities issued by the DHEC, is required. The issuance of a NPDES CGP requires the preparation of a site-specific Stormwater Pollution Prevention Plan.

Future projects that will result in earth disturbances will require coordination with the DHEC to determine the level of specific stormwater management measures and permits required.

4.13. ENERGY SUPPLIES AND NATURAL RESOURCES

Use of energy supplies and natural resources is closely linked to construction of airport improvements and operations. Anticipated growth and development at the Airport is likely to increase the use of energy and natural resources. However, energy and natural resources are relatively abundant in Northwestern South Carolina and planned growth at the Airport is not of sufficient magnitude to alter regional energy demand or limit natural resource availability.

Each proposed project, including those that will lead to an increase in aircraft operations, will be evaluated for the potential effect upon these resources and methods to reduce potential energy uses will be developed and considered during the review process.

4.14. CLIMATE

Climate change is a global phenomenon that has been attributed to increasing concentrations of greenhouse gases (GHGs) in the atmosphere. GHGs include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).

Under EO 13693, *Planning for Federal Sustainability*, federal agencies must make efforts to measure, report, and reduce their GHGs emissions from direct and indirect activities.

The FAA has not identified a significance threshold for GHG emissions as there is no current accepted method of determining the level of significance applicable to airport projects given the small percentage of emissions they contribute. Any increase in emissions of GHGs as the result of a proposed action at the Airport would be considered negligible in comparison with U.S. annual emissions and therefore would not have a significant impact on global climate change.

4.15. SOCIOECONMICS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Under the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR Part 1502.1), federal agencies are required to consider the effects to the area population's health, safety risks to children, and socioeconomic impacts. Under 40 CFR 1508.14, the CEQ requires that the human environment be considered for federal projects to address the relationship of people with their natural and physical environments.

4.15.1. Socioeconomics

Principal impacts to be considered include the displacement of families or businesses, effects to neighborhood characteristics, dividing or disrupting established communities, changing ground transportation patterns, disruption of orderly planned community developments, or creating measurable changes in employment. If land acquisition were necessary for proposed Airport development alternatives, it would be accomplished in accordance with 49 CFR Part 24, *Uniform Relocation Assistance and Real Property Acquisition Policies Act* (Uniform Act), and FAA AC 150/5100-17, *Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects*. The Uniform Act standardizes real property acquisition policies and requires the uniform and equitable treatment of persons relocated due to a federally assisted project.

Proposed projects will be evaluated for the potential effects to the community economy, social structure, and necessary community health and safety services as specific alternatives are developed during the design process.

4.15.2. Environmental Justice

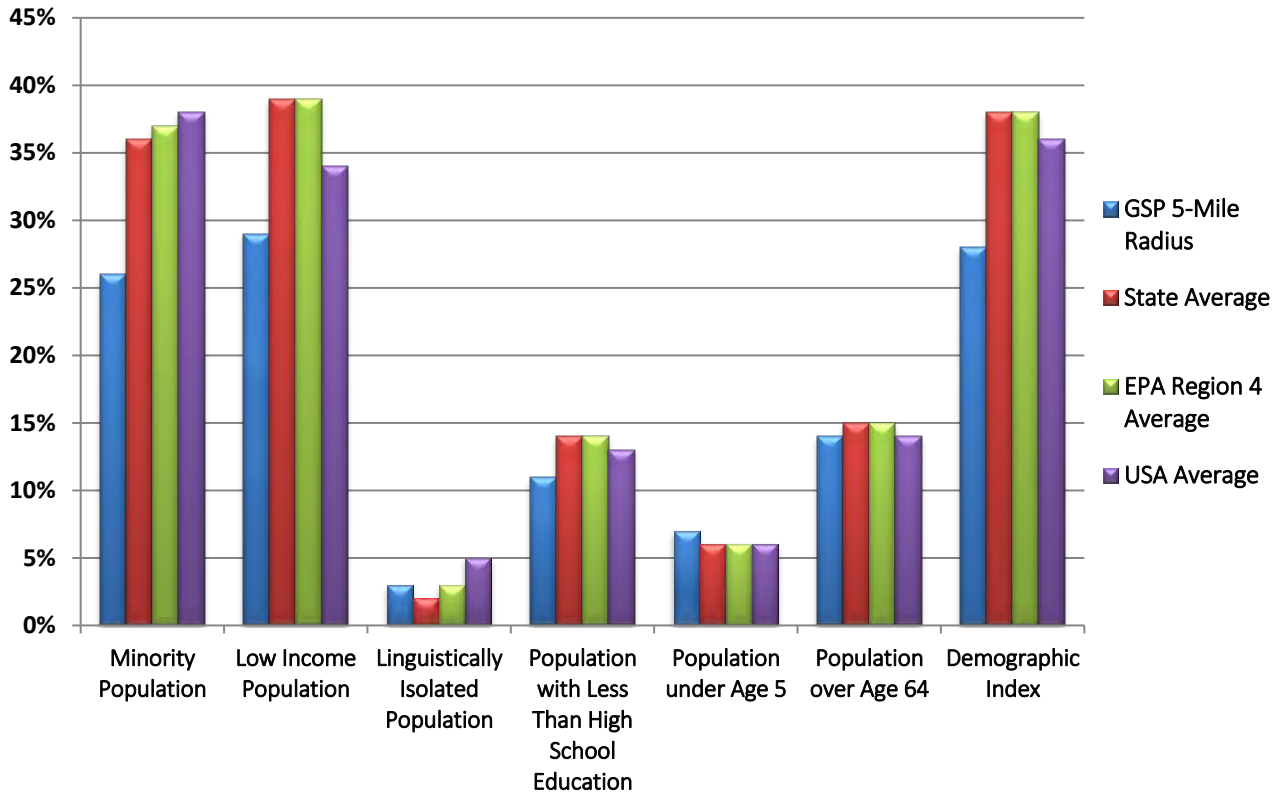
EO 12898 - *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* directs federal agencies to consider the potential effects of federal actions, including those involving federally obligated airports, to cause a disproportionate and adverse effect upon low-income or minority populations.

An environmental justice (EJ) screening of the area within a 5-mile radius centered on the Airport was conducted using the EPA's EJ mapping and screening tool EJSCREEN. EJSCREEN evaluates seven select demographic indicators calculated from the Census Bureau's American Community Survey 2008-2012. These demographic indicators include:

- **Percent Minority -** Percent minority as a fraction of population, where minority is defined as all but Non-Hispanic White Alone.
- **Percent Low-income -** Percent of individuals whose ratio of household income to poverty level in the past 12 months was less than 2 (as a fraction of individuals for whom ratio was determined).
- **Percent Less Than High School Education -** Percent of individuals age 25 and over with less than high school degree.
- **Percent in Linguistic Isolation -** Percent of households in which no one age 14 and over speaks English "very well" or speaks English only (as a fraction of households).
- **Percent Over Age 64 -** Percent of individuals over age 64 as a fraction of the population.
- **Percent Under Age 5 -** Percent of individuals under age 5 as a fraction of population.
- **Demographic Index -** The Demographic Index in EJSCREEN is a combination of percent low-income and percent minority, the two demographic factors that were explicitly named in EO 12898 on EJ. For each census block group, these two numbers are simply averaged together. The formula is as follows: Demographic Index = (percent minority + percent low-income) / 2.

Review of the EJSCREEN data indicates the area within a 5-mile radius of the Airport has a lower minority population and low income population percentages compared to EPA Region 4, State, and United States of America (USA) averages. The lower minority population and low income population percentages have a positive correlation with the demographic index, which is also lower than EPA Region 4, State, and USA averages. All other demographic indices are generally aligned with EPA Region 4, State, and USA data averages. A graphical presentation of the comparison of the data of the area from within a 5-mile radius of the Airport to EPA Region 4, State, and USA data is shown in **Figure 4-5**, Demographic Profile Comparison Graph.

Figure 4-5: Demographic Profile Comparison Graph



Source: EPA EJSCREEN, Accessed October 30, 2017

Based on the aforementioned information, Airport development is not likely to result in a disproportionately high and adverse human health or environmental effect to children, elderly or minority populations. Further analysis will be required during the NEPA evaluation process to ensure that Airport development projects do not significantly adversely effect low-income populations in the vicinity of the Airport.

4.15.3. Children's Environmental Health and Safety Risks

Pursuant to EO 13045 - *Protection of Children from Environmental Health Risks and Safety Risks*, federal agencies are directed to make identification and assessment of environmental health and safety risks that may disproportionately affect children a high priority. Federal agencies are encouraged to ensure that their policies, programs, and activities address any disproportionate risks children may incur from environmental health and safety risks. These risks are generally attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or to which they may be exposed.

The Airport development alternatives under consideration will not disproportionately affect children or products and substances they are likely to come in contact with.

4.16. AIRPORT RECYCLING, REUSE AND WASTE REDUCTION

Airports generate various types of solid waste that could be reduced, reused, or recycled. The FAA Modernization and Reform Act (FMRA) of 2012 compels airports to explore solid waste recycling at their facilities. Specifically, the FMRA expanded the definition of airport planning to include, "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable State and local recycling laws." Other sections of the FMRA specifically discuss addressing issues related to solid waste and recycling at airport as part of a new or updated master plan. This effort is to include:

- The feasibility of solid waste recycling at the airport;
- Minimizing the generation of solid waste at the airport;
- Operation and maintenance requirements;
- Review of waste management contracts;
- The potential for cost savings or the generation of revenue.

4.16.1. Existing Waste Sources

Waste streams at an airport can come from a variety of sources and be handled in multiple ways. Various groups, agreements, operational styles, and collection/disposal processes play into the overall generation and management of waste at an airport. Although a waste audit was not performed as part of this study, four primary sources of waste at GSP were identified. These include, the airfield, the terminal building, airport tenant hangars, and cargo/MRO facilities. Guidance available from the FAA suggests exploring sources of waste relative to three categories of control, including:

- Areas where the airport has direct control of waste management (public space, office space, terminal building, airfield). These areas are controlled by the Airport and they can introduce recycling, reuse, and waste reduction programs directly.
- Areas where the Airport has no direct control but can influence waste management (tenants). These are areas owned by the airport; however, they are leased out to tenants. The Airport can recommend that recycling, reuse, and waste reduction programs be used and can include language in the tenant contracts, but realistically can't control what is done.
- Areas where the Airport has no control or influence over waste management. These are areas the Airport neither owns or leases.

Table 4-5 identifies typical waste generated at GSP from the four airport waste sources identified as well as the level of control the Airport has over that waste stream.

Table 4-5: Waste Sources and Control

Area	Waste Generated	Control
Airfield	General debris, potentially construction material (asphalt, concrete, wood, metal)	Direct Control
Terminal Building	Plastic, glass, mixed paper, aluminum, oil, batteries, commercial food waste, general refuse	Direct Control
Tenant Hangars	Plastics, glass, mixed paper, aluminum, oil, batteries, general refuse	No Direct Control, Has Influence
Cargo/MRO Facilities	Tires, equipment fluid, wooden pallets, plastic packing material, lightbulbs, electronics, batteries, general refuse	No Direct Control, Has Influence

Source: McFarland Johnson, 2017.

4.16.2. Local Recycling and Waste Management Programs

As previously mentioned, solid waste collection and disposal services at GSP is managed by Waste Connections of the Carolinas, a local waste management company located in Duncan, South Carolina through contract with the Airport. Waste Connections of the Carolinas is a responsible partner in properly disposing of waste and working to reduce its environmental impact. The company is capable of supporting recycling services to commercial businesses, multi-tenant buildings, industrial facilities and construction sites.

4.16.3. Overview of Airport Recycling, Reuse, and Waste Management Practices and Opportunities

Presently GSP engages in multiple initiatives focused on minimizing solid waste streams to landfills as well as the on-site reuse of materials as able. These include:

- Stockpiling of suitable earthen fill for use in future development projects on Airport property.
- Collect used oil and coordinate with a recycler for pickup.
- Stockpile recyclables not regularly picked up for an annual event, such as electronics, batteries, etc. and coordinate an annual or semi-annual pickup.
- Selling surplus equipment and other goods through an internet auction site (GovDeals).
- Removal and recycle existing pavement that is not required for future use.
- Providing maintenance group recycling opportunities for tires, bulbs, skids, etc.

Wastes generated at the Airport are, for the most part, similar in nature to that which is developed in a residential community and in volumes that are not excessive or which could put undue burden on the contracted waste disposal company. In addition to the existing recycling and reuse initiatives in place at GSP, opportunity exist to:

- Provide strategically located recycling receptacles, with recyclable sorting directions, within the commercial terminal building.[2]
- Encouraging the recycling of aluminum, glass, plastics, paper, newspapers, magazines, phone books, and corrugate cardboard.[3]
- Implement a Green Concessions Program that would recommend Airport concessionaires reduce the amount of non-biodegradable packaging

Over time, GSP's ability to increase its commitment to airport recycling, reuse and waste reduction will be reliant upon the larger Greenville-Spartanburg community's ability to support and retain quality recycling providers offering a diverse range of recycling services at a reasonable price. The potential economic impact to the Airport should be fully considered prior to implementing any new recycling and reuse initiative.

[2] GSP teamed up with SCDHEC 10 years ago during an initiative to make recycling more attractive in SC. SCDHEC donated recycle receptacles to GSP which were located throughout the parking garages, terminal and concourses. However, they were not being utilized for recycling efforts as trash was comingled inside them and all the trash was placed into a dumpster as municipal solid waste (MSW). The receptacles could have been utilized as recycle containers, but GSP would have needed to install other receptacles for MSW to prevent the comingling that occurred.

[3] An initiative similar to this has been attempted previously with a company named Evergreen Recycling in Anderson SC with a focus on office paper 10+ years ago but was dropped. In 2017, costs were explored for a recycle dumpster provided by Waster Connections. The unit to be placed at GSP would capture cardboard, plastic and aluminum; no decision was made. One limiting factor is placement of the unit in a convenient location for tenant access and having ample ground space for the container inside the secured area. If it's not in a convenient location it won't be utilized.

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE
CHAPTER 5: FACILITY REQUIREMENTS

McFarland Johnson

Table of Contents

5. Facility Requirements 5-1
5.1. Airport Capacity 5-1
5.1.1. Airspace Capacity Analysis 5-1
5.1.2. Airfield Capacity Analysis 5-2
5.1.3. Capacity Calculations 5-8
5.2. Airside Facility Requirements 5-10
5.2.1. Critical Design Aircraft and Runway Design Code 5-10
5.2.2. Pavement Condition 5-10
5.2.3. Runway Length 5-11
5.2.4. Runway Width 5-12
5.2.5. Runway Orientation 5-13
5.2.6. Runway Designation 5-13
5.2.7. Runway Critical Areas 5-14
5.2.8. Runway Pavement Markings 5-18
5.2.9. Taxiway and Taxilane System 5-18
5.2.10. Airfield Lighting and Signage 5-27
5.2.11. Visual Approach Aids 5-27
5.2.12. Airfield Facility Requirements Summary 5-28
5.3. Passenger Terminal Facility Requirements 5-29
5.3.1. Existing Passenger Terminal 5-30
5.3.2. Methodology 5-30
5.3.3. Assumptions 5-32
5.3.4. Results of Analysis 5-37
5.4. Roadway Access and Parking Facility Requirements 5-41
5.4.1. Airport Roadway and Circulation Assessment 5-41
5.4.2. On-Site Parking and Facility Assessment 5-64
5.4.3. Summary of Roadway Access and Parking Facility Requirements 5-68
5.5. Air Cargo Facility Requirements 5-69
5.5.1. Near-Term Cargo Facility Developments 5-69
5.5.2. Methodology 5-69
5.5.3. Assumptions 5-69
5.5.4. Results of Analysis 5-71
5.6. General Aviation Facility Requirements 5-72
5.6.1. Aircraft Hangars 5-72
5.6.2. Aircraft Aprons 5-74
5.6.3. General Aviation Terminal and FBO Facilities 5-76
5.6.4. General Aviation Access and Auto Parking 5-77
5.6.5. General Aviation Facility Requirements Summary 5-77
5.7. Airport Support Facility Requirements 5-78
5.7.1. Air Traffic Control Tower (ATCT) 5-78

5.7.2. Aircraft Rescue and Fire Fighting (ARFF) 5-78
5.7.3. Airfield Maintenance Facility and Equipment 5-79
5.7.4. Aviation Fuel Storage and Distribution 5-80
5.7.5. Support Facility Requirements Summary 5-80
5.8. Forecast Scenario Facility Requirements 5-81
5.8.1. New Ultra Low-Cost Carrier (ULCC) Service 5-81
5.8.2. New LCC Service 5-81
5.8.3. New International Service 5-82
5.8.4. Market Interruption 5-82
5.8.5. Enhanced Aircraft Up-gauging 5-83
5.9. Facility Requirement Summary 5-83

List of Tables

Table 5-1 : Aircraft Fleet Mix 5-6
Table 5-2 : Exit Taxiway Distance from Threshold 5-7
Table 5-3 : Exit Taxiway Cumulative Utilization Percentage 5-7
Table 5-4 : Runway 4 Exit Taxiway Usage Per Conditions 5-8
Table 5-5 : Runway 22 Exit Taxiway Usage Per Conditions 5-8
Table 5-6 : Annual Operations Forecast 5-9
Table 5-7 : Runway Designation Calculation 5-13
Table 5-8 : RPZ Dimensions Per Runway End 5-18
Table 5-9 : Taxiway Requirements – Airplane Design Group 5-19
Table 5-10 : Taxiway Requirements – Taxiway Design Group 5-19
Table 5-11 : Geometry Issues at GSP 5-23
Table 5-12 : Summary of Airside Facility Requirements 5-28
Table 5-13 : Aircraft Seats and Scheduling Peak Characteristics 5-31
Table 5-14 : Peak Hour Vehicle Assumptions 5-33
Table 5-15 : Outbound Baggage and Screening System Assumptions 5-34
Table 5-16 : Terminal Functional Area Requirements 5-38
Table 5-17 : Roadway Existing Conditions Level of Service Table 5-54
Table 5-18 : Roadway Future Conditions Level Of Service 5-56
Table 5-19 : Roadway Access Performance Key Findings 5-63
Table 5-20 : Parking Facilities Overview 5-64
Table 5-21 : Parking and Facilities Performance Key Findings 5-65
Table 5-22 : Passenger Demand Factors 5-66
Table 5-23 : Peak Passenger Parking Demand 5-66
Table 5-24 : Parking and Roadway Access Facility Requirements Summary 5-68
Table 5-25 : Air Cargo Building/Warehouse Ratio Inputs 5-70
Table 5-26 : Air Cargo Apron Parking Requirements 5-70
Table 5-27 : Air Cargo Building/Warehouse Ratio Inputs 5-71
Table 5-28 : Air Cargo Facility Requirements Summary 5-71
Table 5-29 : Existing Hangar Facilities 5-72
Table 5-30 : Aircraft Hangar Demand 5-74
Table 5-31 : Apron Parking Demand 5-75
Table 5-32 : GA Terminal Gross Area Analysis 5-76
Table 5-33 : GA FBO Auto Parking 5-77
Table 5-34 : General Aviation Facility Requirements Summary 5-78
Table 5-35 : Airport Fuel Sale Projection – Jet-A 5-80
Table 5-36 : Airport Fuel Sale Projection – AvGas 5-80
Table 5-37 : Support Facility Requirements Summary 5-81
Table 5-38 : Facility Requirements Total Summary 5-83

List of Figures

Figure 5-1 : VFR Sectional Chart – Atlanta 5-3
Figure 5-2 : Airfield Topography and Slope Analysis 5-15
Figure 5-3 : Taxiway Design Groups 5-19
Figure 5-4 : Inadvisable Rapid-Exit Taxiway Design 5-24
Figure 5-5 : Taxiway Intersection Fillet Analysis 5-25
Figure 5-6 : IATA Level of Service Performance Categories 5-32
Figure 5-7 : Existing Terminal Curb 5-41
Figure 5-8 : Traffic Analysis Study Area 5-43
Figure 5-9 : 2017 Daily Traffic Variation 5-45
Figure 5-10 : 90th Percentile Weekday AM Peak Volumes 7:30-8:30 5-47
Figure 5-11 : 90th Percentile Weekday AM Peak Volumes 8:45-9:45 5-49
Figure 5-12 : 90th Percentile Weekday PM Peak Volumes 4:30-5:30 5-51
Figure 5-13 : Airport-Related Traffic by Destination 5-53
Figure 5-14 : 3 Million Enplanements AM Peak Volumes 7:30-8:30 5-57
Figure 5-15 : 3 Million Enplanements AM Peak Volumes 8:45-9:45 5-59
Figure 5-16 : 3 Million Enplanements PM Peak Volumes 4:30-5:30 5-61

5. Facility Requirements

This chapter presents the airside and landside facility requirements necessary to accommodate existing and forecast demand at Greenville-Spartanburg International Airport (GSP or the Airport) in accordance with Federal Aviation Administration (FAA) design criteria and safety standards. The facility requirements are based upon several sources, including the aviation demand forecasts presented in Chapter 3, *Forecasts;* FAA Advisory Circular (AC) 150/5300-13A, *Airport Design;* 14 Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace,* along with other industry guidance and best practices. The findings of this chapter serve as the basis for the formulation of airport alternatives and development recommendations. The major components of this chapter are listed below:

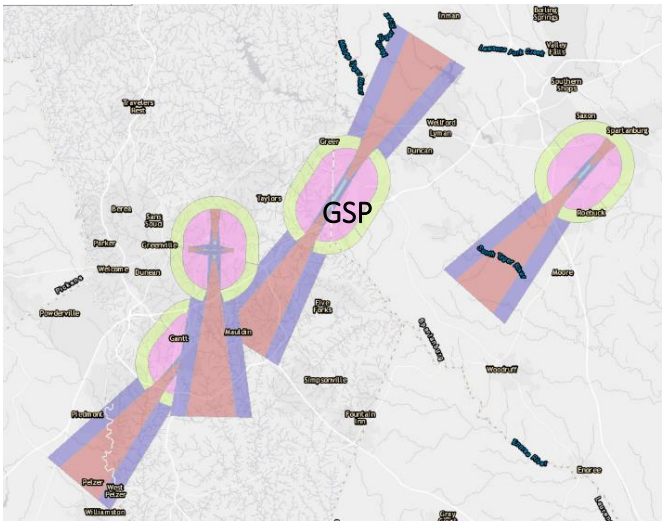
- Airport Capacity
- Airside Facility Requirements
- Passenger Terminal Facility Requirements
- Roadway Access and Parking Facility Requirements
- Air Cargo Facility Requirements
- General Aviation Facility Requirements
- Airport Support Facility Requirements
- Forecast Scenario Facility Requirements
- Facility Requirement Summary

5.1. AIRPORT CAPACITY

5.1.1. Airspace Capacity Analysis

Airspace capacity at an airport is of concern when the flight paths of nearby airports or local navigational aids (NAVAIDS) interact to adversely impact operations at the airport of study. Also of concern is the need to alter flight paths to avoid obstructions during aircraft approaches.

GSP is in a relatively rural area between the metropolitan communities of Greenville to the west, Spartanburg to the east, and the City of Greer to the north. GSP is far enough away from other airports that airspace interest conflicts do not regularly exist. Section 2.1.1 of this report identifies multiple airports in the region, the nearest of which is over seven miles from GSP. A cursory analysis of the alignment of nearby runways and the types of approaches available to those runways indicates that Part 77 approach zone conflicts do exist between the GSP Runway 4 precision approach and the precision approach to



Source: South Carolina Aeronautics Commission, GIS map, 2017

Runway 1 at Greenville Downtown Airport (GMU), as well as with the non-precision approach available to Runway 23 at Donaldson Field Airport (GYH). The proximity of these disparate airspace surfaces is mitigated by the numerous Standard Terminal Arrivals (STARs) published for instrument flight rules (IFR) aircraft to follow when approaching GSP as well as the positive control of air traffic the GSP air traffic control tower (ATCT) maintains within GSP's Class C airspace. Overall, the airspace surrounding GSP is not overly congested by commercial, military, and/or special use airspace such that the Airport's capacity is adversely affected. The FAA VFR Atlanta Sectional Chart is depicted in Figure 5-1, and shows GSP's Class C airspace amongst a variety of regional Class D and Class E airspaces and well outside of Charlotte Douglas International Airport's (CLT) Class B 30 nautical mile ring.

5.1.2. Airfield Capacity Analysis

Airfield capacity refers to the ability of an airport to safely accommodate a given level of aviation activity. The following sections utilize the methodologies described in FAA AC 150/5060-5, *Airport Capacity and Delay*, to model airfield capacity at GSP.

Capacity is described through three terms: annual service volume (ASV), visual flight rules (VFR) hourly capacity, and instrument flight rules (IFR) hourly capacity. The ASV is a reasonable estimate of the annual capacity, or the maximum annual number of aircraft operations that can reasonably be accommodated. It should be noted that airports could, and often do, exceed their stated ASV. However, aircraft delays begin to increase rapidly once the ASV is exceeded.

The VFR and IFR hourly capacities are the maximum number of aircraft operations that can take place on the runway system in one hour under VFR or IFR conditions, respectively. When hourly demand approaches or exceeds the hourly capacity, delays may force traffic into the succeeding hours or cause aircraft to divert to other airports.

Factors Affecting Capacity

It is important to understand the various factors that affect the ability of an air transport system to process demand. Once these factors are identified and their effect on the processing of demand is understood, efficiencies can be evaluated. The airfield capacity analysis considers several factors that affect the ability of the Airport to process aviation demand.

These factors include:

- Meteorological Conditions
- Runway/Taxiway Use Configurations
- Runway Utilization
- Aircraft Fleet Mix
- Percent Arriving Aircraft
- Percent Touch-and-Go Operations
- Exit Taxiway Locations
- Peaking Characteristics

Figure 5-1: VFR Sectional Chart - Atlanta

Source: Atlanta Sectional Aeronautical Chart

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\AIRSPACE.dwg

Meteorological Conditions

Meteorological conditions specific to the location of an airport not only influence the airfield layout but affect the use of the runway system. As weather conditions change, airfield capacity can be reduced by low ceilings and visibility. Runway usage will change as the wind speed and direction change, also impacting the capacity of the airfield.

To better understand the impact of deteriorating weather on capacity, a brief synopsis of aviation flying conditions is provided. For the purposes of capacity evaluation, these flying conditions are described as VFR conditions, IFR conditions, and poor visibility and ceiling (PVC) conditions. VFR conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level (AGL) and the visibility is at least three statute miles. IFR conditions occur when the reported cloud ceiling is at least 500 feet but less than 1,000 feet AGL and/or visibility is at least one statute mile but less than three statute miles. PVC conditions exist when the cloud ceiling is less than 500 feet and/or the visibility is less than one statute mile. Decreasing cloud ceiling and visibility require an increase in aircraft spacing, as mandated by the FAA. This increase in aircraft spacing causes decreases in the frequency at which aircraft can land and depart the airfield over a specified period.

To better understand the impact that inclement weather has on GSP, climate data from the National Oceanic and Atmospheric Administration (NOAA) was obtained and analyzed to determine the ceiling and visibility characteristics at this site. Based on this data, VFR conditions occur at the Airport approximately 75.9 percent of the time and IFR conditions occur approximately 15.2 percent of the time. Finally, PVC conditions are present at the Airport approximately 8.9 percent of the time.

Wind direction and speed determine the desired alignment and configuration of the runway system. If possible, aircraft desire to take off and land into the wind. On departure into the wind, the air flowing over the wings allows the airplane to become airborne much sooner than under a no-wind or tail-wind condition. An aircraft landing into the wind will be able to slow down on approach much easier and land at a slower ground speed without any loss of aerodynamic efficiency. Runways not orientated to take the most advantage of the prevailing winds at the site will restrict capacity of an airport to varying degrees as aircraft will have greater runway occupancy times.

Runway/Taxiway Use Configurations

The configuration of the runway system refers to the number, location, and orientation of the active runways, the type and direction of operations, and the flight rules in effect at a particular time. GSP has a single bi-directional runway (Runway 4-22) supported by a full-length parallel taxiway, Taxiway L. Access to runway ends are provided by Taxiway A and Taxiway B at the Runway 4 end and Taxiway J and Taxiway K at the Runway 22 end. Taxiway C provides an entrance/exit location from Runway 4-22 just beyond the Runway 4 aiming point and four rapid-exit taxiways are located near midfield. Taxiway E and Taxiway G allow for aircraft to rapidly exit the runway after landing on Runway 4 and Taxiway F and Taxiway D serve a similar function for aircraft landing on Runway 22. Acute angle fillets are not in place for any of the rapid-exit taxiways where they intercept the runway and as such define operational use of the taxiways to a single direction.

Runway 4-22 at GSP is well equipped with exit taxiways to ensure aircraft can access and exit the runway in an efficient manner.

Runway Utilization

As identified in the meteorological conditions section, aircraft generally desire to take off and land into the wind. Since both ends of Runway 4-22 are supported by instrument approach procedures, both are available during VFR and IFR weather conditions. During times weather conditions are especially poor, aircrew and aircraft with special certification are more likely to execute an approach to Runway 4 at GSP as CAT II and CAT III ILS (instrument landing system) approaches are available. CAT II and CAT III ILS approaches allow for more precise landing and roll-out control than provided by the traditional CAT I ILS that is available to both the Runway 4 and Runway 22 ends at GSP.

Review of the annualized wind conditions obtained through the National Geophysical Data Center (NGDC) and consultation with on-site air traffic control (ATC) representatives confirmed that approximately 55 percent of the time Runway 22 is favored, and the remaining 45 percent of the time airfield operations utilize Runway 4.

Aircraft Fleet Mix

The capacity of a runway is also dependent upon type and size of aircraft that use it. As per FAA AC 150/5060-5, aircraft are placed into one of four classes (A through D) when conducting capacity analysis. These classes are based on the amount of wake vortex created when the aircraft passes through the air. They differ from the classes used in the determination of the aircraft approach category (AAC). Small aircraft departing behind larger aircraft must hold longer or provide greater separation for wake turbulence to dissipate. The greater the separation distance required, the lower the airfield's capacity.

For the purposes of capacity analysis, Class A consists of aircraft in the small wake turbulence class, single engine and a maximum takeoff weight of 12,500 pounds. Class B is made up of aircraft similar to Class A, but with multiple engines. Class C aircraft are in the large wake turbulence class with multiple engines and with takeoff weights between 12,500 pounds and 300,000 pounds. Class D aircraft are in the heavy wake turbulence class and have multiple engines and a maximum takeoff weight greater than 300,000 pounds. Typically, Class A and B aircraft are general aviation (GA) single engine and light twin engine aircraft. Class C and D consist of large jet and propeller driven aircraft generally associated with larger commuter, airline, air cargo, and military use.

The aircraft fleet mix is defined by the percentage of operations conducted by each of these four classes of aircraft at GSP. The approximate percentage of operations forecasted at GSP by each of these types of aircraft is shown in Table 5-1.

Table 5-1: Aircraft Fleet Mix

Aircraft Type	2016 Percent of Operations	2037 Percent of Operations
Class A	1%	1%
Class B	1%	1%
Class C	95%	90%
Class D	3%	8%

Source: McFarland Johnson Analysis, 2017.

The mix index for an airport is calculated as the percentage of Class C aircraft operations, plus three times the percentage of Class D operations (%C + 3D). At airports with only Class A and B aircraft, the separation distance required for air traffic is lower than at airports with use by aircraft in Class C or D, as small aircraft departing behind larger aircraft must hold longer for wake turbulence separation. The greater the separation distance required, the lower the airfield's capacity. The mix index used in capacity calculations is 104 presently growing to 114 by 2037.

Percent Arriving Aircraft

The capacity of the runway is also influenced by the percentage of aircraft arriving at the Airport during the peak hour. Arriving aircraft are typically given priority over departing aircraft; however, arriving aircraft generally require more time to land than departing aircraft need to take off. Therefore, the higher the percentage of aircraft arrivals during peak periods of operations, the lower the ASV. Discussions with Airport personnel indicate that operational activity at GSP is generally well balanced between arrivals and departures. Therefore, it is assumed in the capacity calculations that arrivals equal departures during the peak period.

Percent Touch-and-Go Operations

A touch-and-go operation refers to an aircraft maneuver in which the aircraft performs a normal landing touchdown followed by an immediate takeoff, without stopping or taxiing clear of the runway. A touch-and-go is counted as two operations. These operations are normally associated with training and are included in the local operations figures reported by the air traffic control tower (ATCT). Based on historical data from the Airport and the ATCT, touch-and-go operations comprise less than one percent of total operations at the Airport. This condition is not likely to change over the planning period.

Exit Taxiway Locations

A final factor in analyzing the capacity of a runway system is the ability of an aircraft to exit the runway as quickly and safely as possible. The location, design, and number of exit taxiways affect the occupancy time of an aircraft on the runway system. The longer an aircraft remains on the runway, the lower the capacity of that runway.

Existing exit taxiways for Runway 4-22 are detailed in Table 5-2.

Table 5-2: Exit Taxiway Distance from Threshold

Taxiway	Location
Taxiway A	Located at the Runway 4 threshold
Taxiway B	Located 365 feet from the Runway 4 threshold Located 10,635 feet from the Runway 22 threshold
Taxiway C	Located 2,080 feet from the Runway 4 threshold Located 8,920 feet from the Runway 22 threshold
Taxiway D	Inaccessible when landing Runway 4 Located 6,630 from the Runway 22 threshold
Taxiway E	Located 4,940 from Runway 4 threshold Inaccessible when landing Runway 22
Taxiway F	Inaccessible when landing Runway 4 Located 4,420 from the Runway 22 threshold
Taxiway G	Located 7,180 from Runway 4 threshold Inaccessible when landing Runway 22
Taxiway J	Located 10,635 feet from the Runway 4 threshold Located 365 feet from the Runway 22 threshold
Taxiway K	Located at the Runway 22 threshold

Source: McFarland Johnson, 2017.

FAA AC 150/5300-13A provides guidance regarding the number and location of exit taxiways as shown in **Table 5-3**.

Table 5-3: Exit Taxiway Cumulative Utilization Percentage

Distance Threshold to Exit	Wet Runways				Dry Runways				Dry Runways			
	Right and Acute Angle Exits				Right Angled Exits				Acute Angled Exits			
	A	B	C	D	A	B	C	D	A	B	C	D
2,000	60	0	0	0	84	1	0	0	90	1	0	0
2,500	84	1	0	0	99	10	0	0	99	10	0	0
3,500	99	41	0	0	100	81	2	0	100	82	9	0
4,000	100	80	1	0	100	98	8	0	100	98	26	3
4,500	100	97	4	0	100	100	24	2	100	100	51	19
5,000	100	100	12	0	100	100	49	9	100	100	76	55
5,500	100	100	27	0	100	100	75	24	100	100	92	81
6,000	100	100	48	10	100	100	92	71	100	100	98	95
6,500	100	100	71	35	100	100	98	90	100	100	100	99
7,000	100	100	88	64	100	100	100	98	100	100	100	100
8,500	100	100	100	99	100	100	100	100	100	100	100	100

Note: A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13).

According to the AC, the percent of aircraft exiting after landing on Runway 4 are shown in **Table 5-4**.

Table 5-4: Runway 4 Exit Taxiway Usage Per Conditions

Taxiway	Disposition	Weight Class			
		A	B	C	D
Taxiway C	Wet	60	0	0	0
	Dry	84	1	0	0
Taxiway E	Wet	100	97	4	0
	Dry	100	100	51	19
Taxiway G	Wet	100	100	88	64
	Dry	100	100	100	100

Note: Taxiway D and Taxiway F are inaccessible when landing on Runway 4 because no acute angle fillet exists between that taxiway and runway to allow for exiting at these locations.

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson, 2017.

According to the AC, the percent of aircraft exiting after landing on Runway 22 are shown in Table 5-5.

Table 5-5: Runway 22 Exit Taxiway Usage Per Conditions

Taxiway	Disposition	Weight Class			
		A	B	C	D
Taxiway F	Wet	100	80	1	0
	Dry	100	98	26	3
Taxiway D	Wet	100	100	71	35
	Dry	100	100	100	99
Taxiway C	Wet	100	100	100	99
	Dry	100	100	100	100

Note: Taxiway E and Taxiway G are inaccessible when landing on Runway 22 because no acute angle fillet exists between that taxiway and runway to allow for exiting at these locations.

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson, 2017.

5.1.3. Capacity Calculations

FAA AC 150/5060-5 provides guidance used to calculate airfield capacity and provide planning estimates on hourly airfield capacity under both VFR and IFR conditions, which represent the theoretical maximum number of aircraft operations (takeoffs and landings) that can take place on the runway system in one hour under VFR or IFR conditions, respectively. The various capacity elements are then consolidated into a single figure, the ASV for the Airport. The ASV is the theoretical maximum number of aircraft operations that the Airport can support over the course of a year.

VFR/IFR Hourly Capacities

Because characteristics of airports vary so widely, guidance in FAA AC 150/5060-5 is provided for different types of airports, from large commercial service hubs, to small single runway facilities. According to the AC, VFR and IFR capacity calculations are based on certain assumptions such as the previously calculated mix index. These assumptions and their relevance to GSP are described below:

- The Airport is currently used by approximately two percent Class A/B aircraft, 95 percent by Class C aircraft and three percent by Class D aircraft. In the future, it is anticipated use will change to include operations by approximately two percent Class A/B aircraft, 90 percent by Class C, and eight percent by Class D aircraft. This transition will be smoothed across the planning period and applied appropriately in each forecast year for capacity calculations.
- The Airport currently has a full-length parallel taxiway with ample entrance and exit taxiways spaced at a distance away from each threshold to allow for the large majority of aircraft to effectively and efficiently exit the active runway area.
- The Airport has two runway ends equipped with an ILS approaches and necessary ATC facilities to carry out operations in a radar environment.
- Arrivals equal departures and no airspace limitations affect runway use.
- Percentage of touch-and-go operations is less than one percent.

Guidance in FAA AC 150/5060-5 was used to determine the ASV. Table 5-6 presents a summary of the airfield capacity calculations for GSP utilizing the data and assumptions outlined above and compares that to current and forecast levels of activity.

Table 5-6: Annual Operations Forecast

Year	Demand			Calculated Capacity			Percent Peak Hour		Percent ASV
	Annual	Avg. Day Peak Month	Peak Hour	Hourly VFR	Hourly IFR	ASV[1]	VFR	IFR	
2017	44,632	137	16	55	53	176,400	29%	30%	25%
2022	46,562	143	17			175,000	31%	32%	27%
2027	49,479	152	19			176,300	35%	36%	28%
2037	55,885	171	21			172,850	38%	40%	32%

[1]*ASV was adjusted to the median between calculated ASV and the prescribed ASV for a single runway system like GSP as detailed in FAA AC 150/5060-5,* Airport Capacity and Delay.

Source: McFarland Johnson Analysis, 2017.

FAA guidelines suggest that airports should initiate planning for capacity improvements when annual aircraft operations reach 60 percent of the ASV. GSP is not anticipated to reach that target within the planning period. However, while airfield capacity enhancing projects will not be required over the 20-year planning period, this report has already identified areas for Airport improvement to better meet design standards and better meet the needs of Airport users. The subsequent sections of this chapter will identify future facility improvements for GSP that are

intended to accommodate existing and proposed levels of traffic more safely, efficiently, and economically.

5.2. AIRSIDE FACILITY REQUIREMENTS

Airside facility requirements address the items that are directly related to the arrival and departure of aircraft, primarily runways and taxiways and their associated safety areas. To assure that all runway and taxiway systems are correctly designed, the FAA has established criteria for use in planning and design of airfield facilities. The selection of appropriate FAA design standards for the development of airfield facilities is based on the characteristics of the most demanding aircraft expected to use an airport or that particular facility on a regular basis (500 operations or more per year). Correctly identifying the future aircraft types that will use an airport is particularly important, because the design standards that are selected establish the physical dimensions of facilities, and the separation distances between facilities that will impact airport development for years to come. Use of appropriate standards will ensure that facilities can safely accommodate aircraft using the Airport today, as well as aircraft that are projected to use the Airport in the future.

5.2.1. Critical Design Aircraft and Runway Design Code

As identified in FAA AC 150/5300-13A, *Airport Design,* airport design standards provide basic guidelines for safe, efficient, and economic airport systems. This document provides criteria for grouping of aircraft into runway design codes (RDC) to prescribe standardized design criteria to airports of various size and utility. As described in Section 3.9 of this report, the RDC is derived from the features of the most demanding aircraft using the Airport on a regular basis coupled with the best available instrument approach minimums achievable on the airfield. Presently, the Boeing 767-300F, an RDC D-IV aircraft, is identified as the critical aircraft for GSP. In the future, however, the Boeing 747-400F and eventually the Boeing 747-8F are anticipated to replace the 767-300F as the Airport's critical aircraft requiring the Airport to meet airfield design standards for RDC D-V, and D-VI, respectively.

5.2.2. Pavement Condition

Pavement strength requirements are related to three primary factors: the weight of aircraft anticipated to use an airport, the landing gear type and geometry, and the volume of aircraft operations. Airport pavement design, however, is not predicated on a particular weight that is not to be exceeded. Design is based on the mix of aircraft that are expected to use the runway over the anticipated life of the pavement (usually 20 years). The methodology used to develop the runway pavement design considers the number of operations by both large and small aircraft and reduces this data to a number of "equivalent annual operations" by a design aircraft, which is the most demanding in terms of pavement loading expected to use an airport. This may or may not be the design aircraft for planning purposes and its selection considers the type of landing gear and tire pressure in addition to weight. The outcome of the design process is a recommended pavement section that will accommodate operations by the forecast fleet mix and withstand weather stresses without premature failure of the pavement.

As detailed in **Appendix A** of this report, a pavement management plan (PMP) was prepared as part of this study. The PMP includes the following components:

- Nondestructive testing for airside pavements
- PCN computation
- Structural evaluation
- Rehabilitation recommendations
- Evaluation report

The report contains the data gathered in the field and its analysis, rehabilitation recommendations and approximate cost estimates. During the field inspection pavement condition was assessed and specific pavement distresses and their severity level were noted. Additionally, analysis was conducted to better understand the structural capacity of the existing pavement sections and their anticipated life remaining based on the forecasted mix and volume of aircraft.

Over the period of 2019-2024 the PMP identifies the need for multiple pavement rehabilitation projects including the following:

- Mill and overlay 4" on Taxiway D and Taxiway G
- Mill and overlay 2" on Taxiway L, including L2, L3 and L4
- Full depth reconstruction of Taxiway L5 and L6
- Mill and overlay 2' Runway 4-22 asphalt, including shoulders and blast pads
- Localized PCC repairs and joint sealing (RW4-22, Taxiways A, B, C, J, K & L)
- Localized PCC repairs and joint sealing (south cargo apron, north cargo apron, GA apron)
- Reconstruct itinerant apron

Recommendation: Program, schedule, and execute PMP prescribed pavement rehabilitations and continue on-going preventative maintenance on all airfield pavements.

5.2.3. Runway Length

A wide variety of aircraft use GSP daily. These aircraft, both large and small, have different runway requirements. In some cases, smaller or older aircraft may require more runway length than larger or more efficient aircraft. A significant number of factors go into determining the runway performance of an aircraft such as airport elevation, aircraft weight, temperature, flap settings, payload, or runway condition (wet/dry), which then dictate the runway requirements that must be met for an aircraft to utilize that runway.

The FAA has published AC 150/5325-4B, *Runway Length Requirements for Airport Design*, to assist in the determination of the required runway length. Per FAA AC 150/5325-4B, both future design aircraft should be reviewed on an individual basis, as both are greater than 60,000 pounds in their maximum takeoff configuration.

Boeing 747-400F – The Boeing 747-400F has a maximum takeoff weight (MTOW) of 875,000 pounds of which a maximum of 274,100 pounds is available for payload. The 747-400F can range up to 4,300 nautical miles (nm) from GSP in a full payload configuration, and over 7,000 nm in a payload-limited configuration in optimal conditions. This range allows for operations to destinations as far as western Alaska, Great Britain, Germany, and Austria when fully loaded, and Japan, West Africa, and Saudi Arabia when optimized for a long-haul route.

However, the Boeing 747-400F aircraft performance manual (APM) indicates that the 747-400F is only capable of departing GSP while at its MTOW when conditions are at or below 55 degrees Fahrenheit and the runway is not contaminated with any water or ice. Based on hourly reporting from GSP's on-site Automated Surface Observing System (ASOS) obtained through the National Climatic Data Center (NCDC) for the previous 10-years, temperatures at the Airport are only at or below 55 degrees approximately 36 percent of the time. Thus, the 747-400F is often unable to operate fully loaded from GSP and must reduce its weight in either payload or fuel load to execute a safe departure from the Airport, depending on destination. Based on guidance made available in the 747-400F APM, departures at MTOW would be achievable on a 12,000-foot runway in temperatures as high as 86 degrees.

Presently, however, the longest stage length for cargo aircraft operating from GSP is to Frankfurt-Hahn Airport in Germany, some 4,414 nautical miles from GSP according to great circle calculations. As such, during early morning departures (as is typical for cargo operators) when the weather is cool, the 747-400F could depart in a nearly full payload configuration and still reach HHN on a non-stop route.

Boeing 747-8F – The Boeing 747-8F has a MTOW of 987,000 pounds of which a maximum of 308,000 is available for payload. The 747-8F can range up to 4,500 nm from GSP in a full payload configuration, and approximately 8,000 nm in a payload-limited configuration, assuming optimal conditions. This range allows for similar capabilities as the 747-400F when fully loaded, and destinations as far as Auckland, New Zealand and Bombay, India when optimized for a long-haul route.

Unlike the 747-400F, the 747-8F is able to depart GSP at MTOW when the temperature is at or below 82 degrees Fahrenheit which accounts for approximately 91 percent of on-site ASOS observations from the previous 10-year period.

Recommendation: No runway length improvements required. The existing 11,001-foot runway will be sufficient to support operations at GSP.

5.2.4. Runway Width

Runway 4-22 is 150 feet wide, which meets FAA standards for C/D/E-III/IV/V runways. In the future, the 747-8F, a D-VI aircraft, is anticipated to become the critical aircraft at GSP. The runway width for airplane design group (ADG) for this size of aircraft is 200 feet with 40-foot wide paved shoulders on either side. However, the Airport has already received approval for a modification of standards (MOS) to provide runway width, shoulder, and blast pads dimensions for D-V aircraft, despite the 747-8F's D-VI classification. This is permitted by FAA Engineering Brief No. 74A which speaks directly to this condition, saying "the B747-8 aircraft demonstrated during the flight certification program that it can be safely operated on runways as narrow as 150 feet wide."

Recommendation: No runway width improvements required. The existing 150-foot wide runway will be sufficient to support operations at GSP.

5.2.5. Runway Orientation

A significant factor in evaluating a runway's orientation is the direction and velocity of the prevailing winds. A runway alignment that does not allow an aircraft to go directly into the wind creates what is known as a crosswind component (i.e. winds at an angle to the runway in use), which makes it more difficult for a pilot to guide the airplane down the intended path. The commonly used measure of degree to which a runway is aligned with the prevailing wind conditions is the wind coverage percentage, which is the percent of time crosswind components are below an acceptable velocity. Essentially, this measure indicates the percentage of time aircraft within a particular design group will be able to safely use the runway.

Section 2.1.2 of this report identifies that Runway 4-22 at GSP is well positioned to maximize its ability to provide for aeronautical operations into the wind. In both the all-weather and IFR conditions, Runway 4-22 provides above 98 percent wind coverage for all categories of aircraft.

Recommendations: No change in runway orientation is required.

5.2.6. Runway Designation

A runway is identified by the whole number nearest the magnetic azimuth of the runway when oriented along the runway centerline, as if on approach to that runway end, and designated as such through painted markings. This number is then rounded off to the nearest unit of ten. Magnetic azimuth is determined by adjusting the geodetic azimuth associated with a runway to compensate for magnetic declination. Magnetic declination is defined as the difference between true north and magnetic north which varies over time and is relative to any specific location on Earth. Magnetic declination is a natural process and does periodically require the re-designation of runways.

The current magnetic declination for the Greenville-Spartanburg area was derived from the NGDC in September of 2017 and calculated to be 06°47'00" West changing by 4.0' West per year. Using the information provided through the aeronautical survey conducted for this study effort the true bearing of each runway was calculated. Using the method of *West is best – East is least*, the declination of 06°47'00" West would need to be added to the Runway's true bearing to determine its magnetic bearing. **Table 5-7** conducts this calculation and identifies that all runways are appropriately designated. Furthermore, based on the projected change in declination over time it is unlikely that the runway will required re-designation over the 20-year planning period.

Table 5-7: Runway Designation Calculation

Runway	True Bearing	Magnetic Declination	Magnetic Bearing	Required Designation
4	32°53'22"	+ 06°47'00"	39°40'22"	4
22	212°53'22"	+ 06°47'00"	219°40'22"	22

Source: McFarland Johnson, 2017.

Recommendations: No change in runway designation is required.

5.2.7. Runway Critical Areas

The following sections discuss the runway safety area, the runway object free area and the runway protection zones for GSP and the ability of those critical areas to meet design standards. Figure 5-2 depicts these areas and will be used to inform the following discussions and recommendations.

Runway Safety Areas

Runway safety areas (RSAs) are defined by the FAA as surfaces surrounding a runway that are prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. RSAs consist of a relatively flat graded area free of objects and vegetation that could damage aircraft. According to FAA guidance, the RSA should be capable, under dry conditions, of supporting aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft. The FAA design standards for RSAs surrounding runways serving D-IV, D-V, and D-VI aircraft are all identical. These category runways require an RSA width of 500 feet, a length that provides 600 feet prior to the landing threshold and extends 1,000 feet beyond the departure runway end. Additionally, transverse and longitudinal grade requirements must be met across the RSA. Transverse grades are to be between 1.5 and three percent downward from the edge of pavement and longitudinal grades are permitted between zero and three percent for the first 200 feet beyond a pavement end and up to five percent downward slope for the remainder of the RSA length.

As detailed in Figure 5-2, the Runway 4-22 RSA at GSP meets the dimensional requirements established through FAA AC 5300-13A, *Airport Design*, for RDC D-IV, D-V, and D-VI aircraft, as no incompatible uses or equipment exists within the limits of the RSA. Topographically, however, the RSA fails to maintain full compliance with longitudinal and/or transverse grades across its length and width, in some areas exceeding 50 percent of the maximum slope. Grading projects should be incorporated into future pavement projects to bring the RSA into full compliance with standards.

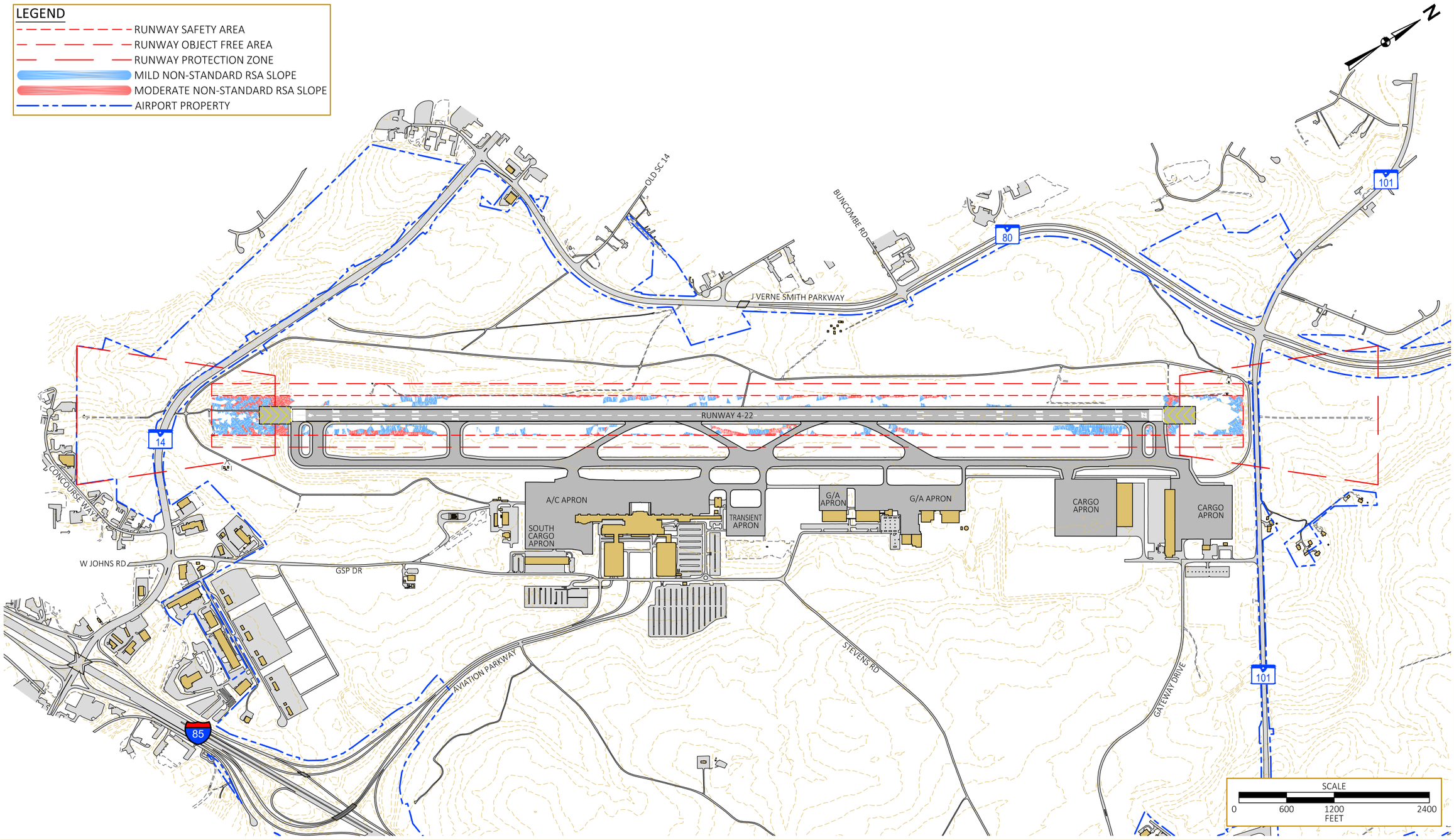
Recommendation: Develop a grading program to address grade compliance issues within the RSA. The focus should first be on the areas beyond the departure end of Runway 22 and Runway 4 before addressing transverse grade requirements along the sides of the runway.

Runway Object Free Areas

In addition to the RSA, a runway object free area (ROFA) is also defined around runways to enhance the safety of aircraft operations. The FAA defines ROFA as an area cleared of all objects except those that are related to navigational aids and aircraft ground maneuvering. However, unlike the RSA, there is no physical component to the ROFA. Thus, there is no requirement to support an aircraft or emergency response vehicles.

Similar to the FAA design standards for RSA, the standards for ROFAs surrounding runways serving RDC D-IV, D-V, and D-VI aircraft are identical. Such runways are required to maintain a ROFA width of 800 feet, a length that extends 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the departure runway end.

Figure 5-2: Airfield Critical Areas, Topography and Slope Analysis



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\AIRFIELD CRITICAL AREAS.dwg

This page has been intentionally left blank.

The ROFA surrounding Runway 4-22 at GSP is unencumbered with incompatible uses or activities and has no physical obstructions within its limits which protrude above the plane of the RSA (or runway elevation).

Recommendation: No improvements or modifications to the ROFA are identified.

Object Free Zones

The object free zone (OFZ) clearing standard precludes aircraft and other object penetrations, except for frangible NAVAIDs that need to be located in the OFZ because of their function.

Runway Object Free Zone

The ROFZ is a defined volume of airspace centered on the runway centerline, above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The ROFZ at GSP is 400 feet wide and extends 200 feet past each end of Runway 4-22 and has no object penetrations.

Inner-Approach OFZ

The inner-approach OFZ is a defined volume of airspace centered on the approach area. At GSP, both Runway 4 and Runways 22 must consider the requirements of the inner-approach OFZ as both have approach lighting systems. This OFZ begins 200 feet from the runway threshold, is as wide as the standard OFZ, and extends 200 feet past the last light in the approach lighting system while rising at a 50:1 slope.

The Runway 4 and Runway 22 inner-approach OFZ at GSP are both cleared and unencumbered.

Inner-Transitional OFZ

The inner-transitional OFZ is a defined volume of airspace along the sides of the ROFZ and inner-approach OFZ. At GSP, both Runway 4 and Runway 22 must consider the requirements of the inner-transitional OFZ as both have approaches with visibility minima below ¾ statute mile.

The Runway 4-22 inner-transitional OFZ at GSP are cleared and unencumbered.

Precision OFZ

The precision OFZ is a defined volume of airspace above an area beginning at the threshold elevation and centered on the extended runway centerline – 200 feet long and 800 feet wide. This OFZ is in effect when an aircraft is on approach to a vertically guided runway during poor weather conditions and requires aircraft and non-critical vehicles over 10 feet in height remain clean of the area.

The Runway 4 and Runway 22 precision OFZ at GSP are both cleared and unencumbered.

Runway Protection Zones

RPZs are large trapezoidal areas on the ground off each runway end that are within aircraft approach and departure paths. The RPZ begins 200 feet beyond the end of the area usable for takeoff and landing for all runways.

The RPZ is intended to enhance the protection of people and property on the ground. Many land uses (i.e. residential, places of public assembly, fuel storage) are prohibited by FAA guidelines within these areas. However, these limitations are only enforceable if the RPZ is owned or controlled by the airport sponsor. Airport control of these areas is strongly recommended and is primarily achieved through Airport property acquisition but can also occur through easements or zoning to control development and land use activities.

The dimensions of the RPZ for each runway end are a function of the type of aircraft and the approach visibility minimums associated with operations on that runway. The existing approach visibility minimums are shown in **Table 5-8**.

Table 5-8: RPZ Dimensions Per Runway End

Runway	Length	Inner Width	Outer Width	Acreage
Runway 4	2,500'	1,000'	1,750'	78.914
Runway 22	2,500'	1,000'	1,750'	78.914

Source: FAA AC 150/5300-13A

As detailed in Table 5-8, both the Runway 4 and Runway 22 RPZs remain predominately on property. The Runway 4 RPZ is bifurcated by SC Highway 14 for which a right of way easement is provided, and the Runway 22 RPZ is similarly bifurcated by SC Highway 101 for which a right of way easement is provided. Additionally, a small portion of the northern extent of the Runway 22 RPZ crosses SC Highway 80 for which right of way easement is provide.

Recommendation: No action with respect to RPZ property is required.

5.2.8. Runway Pavement Markings

Both ends of Runway 4-22 have precision instrument approach runway markings. There are no plans for the establishment of any new precision instrument approach, nor modification of any current approach which would require remarking of the existing runway markings. Consequently, the runway markings at the Airport are appropriate for their current and future approach requirements respectively.

Recommendation: No improvements to the existing runway pavement markings are required.

5.2.9. Taxiway and Taxilane System

Planning standards for taxiways include taxiway width, taxiway safety areas, taxiway object free areas, taxiway shoulders, taxiway gradient, and for parallel taxiways, the distance between the runway and taxiway centerlines. Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of deviation. The allowance for deviation is provided by the Taxiway Edge Safety Margin (TESM), which is measured from the outside of the landing gear to the taxiway edge. Adequate pavement fillets should be provided on turns to ensure the prescribed TESM is maintained when the pilot guides the aircraft around turns while the cockpit follows the centerline.

The dimensions of each standard vary based on the identified ADG and taxiway design group (TDG) for each taxiway. The ADG is based on the wingspan and tail height of an aircraft, while the TDG is

based on the distance between an aircraft's cockpit to main gear, as well as the width of the main gear. There are six ADG groups, and seven TDG groups. Details regarding the various dimensions follow in **Table 5-9**, **Table 5-10**, and **Figure 5-3**.

Table 5-9: Taxiway Requirements – Airplane Design Group

Design Standard	ADG I	ADG II	ADG III	ADG IV	ADG V	ADG VI
Taxiway Safety Area	49	79	118	171	214	262
Taxiway Object Free Area	89	131	186	259	320	386
Runway/Taxiway Separation	225 – 400*	240 – 400*	400	400	400	500*

*Note: * Runway/taxiway separation vary based on approach visibility minimums*

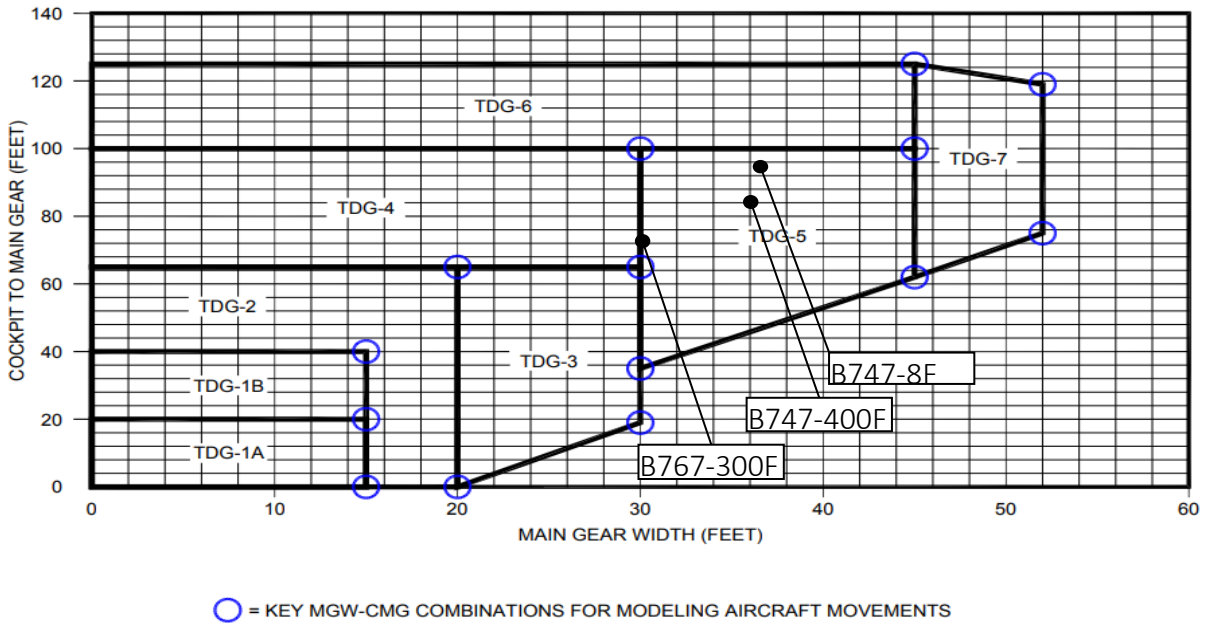
Source: FAA AC 150/5300-13A.

Table 5-10: Taxiway Requirements – Taxiway Design Group

Design Standard	TDG-1	TDG-2	TDG-3	TDG-4	TDG-5	TDG-6	TDG-7
Taxiway Width	25	35	50	50	75	75	82
Taxiway Shoulder Width	10	10	20	20	25	35	40

Source: FAA AC 150/5300-13A.

Figure 5-3: Taxiway Design Groups



Source: FAA AC 150/5300-13A Airport Design.

As taxiways are constructed or rehabilitated, design should carefully consider the recently updated guidance for taxiway design as published in FAA AC 150/5300-13A. The new requirements include the design of taxiways for cockpit over centerline taxiing as opposed to judgmental oversteering. This change particularly impacts curves and intersections, which will require changes to accommodate the cockpit over centerline taxiing. The dimensions of intersection fillets and taxiway curves are based on the associated TDG for each taxiway.

The future design aircraft (B747-400F and B747-8F) for GSP are categorized as D-V and D-VI, respectively, and both are TDG-5 aircraft. As such, GSP taxiways expected to serve all categories

of aircraft must meet safety/object free area and other geometric requirements established for ADG V and eventually ADG VI aircraft. Additionally, those taxiways must also meet taxiway width, shoulder and fillet geometry based on TDG-5 standards. Taxiways not intended to be utilized by all categories of aircraft need not be developed to ADG V or VI or TDG-5 standards, and instead can be developed to the standard in place for the most demanding aircraft making regular use of that pavement section.

Existing taxiways and taxilanes are described in Section 2.2.2. All taxiways at GSP with exception of L5, L6, and the two taxilanes accessing the transient apron are intended to be utilized by TDG-5 and potentially TDG-6 aircraft. The remaining taxiways should meet the requirements for TDG 3 aircraft to best serve the predominate GA and commercial fleet which most utilize those pavements. Presently all taxiways meet width, shoulder, edge safety margin, safety area and object free area design requirements. Some operational limitations will be realized when operating group VI traffic at GSP, such as the non-standard Group VI separation between Taxiways A and B and also Taxiways J and K which will prevent the simultaneous use of those pavements by wide body aircraft. Additionally, taxiway separations from parallel centerlines and fixed/moveable objects all meet or exceed design requirements for TDG-5, with exception of the distance between Taxiway L and the parallel commercial apron taxilane. This non-standard separation is justified through FAA Engineering Brief (EB) 78 which shows through calculation that the existing 257-foot separation is acceptable over the standard 267-foot separation. Lastly, not all taxiway intersection fillet dimensions meet TDG-5 requirements as fillets are often designed considering the largest aircraft making a particular turning movement. The ability of GSP taxiway intersections to support movements, in all directions, of TDG-5/6 aircraft are explored in a subsequent section.

Recommendation: Taxiways and taxilanes should be capable of meeting design standards for the most demanding aircraft making regular use of the particular taxiway/lane segment. Further, the taxiway system should minimize adverse geometry conditions which may create hotspots or chokepoints and fillets should be expanded where necessary to permit movement of large wide-body aircraft.

Potential Hot Spots and Geometry Requirements

A hot spot is defined as "a location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary."[1] There are no published hot spots at the Airport however, certain areas of the airfield meet the FAA's definition and require further review.

Since 1983 31 incidents have occurred at the airport.[2] Of these 31 incidents only five occurred during the taxiing phase with only minor damage occurring in three of the cases. None of the cases resulted in a runway incursion. Detailed review of these incidents does not reveal any taxiway pavement geometry issues or points of confusion to pilots.

---

[1] *Runway Safety – Hot Spot List, accessed Oct. 12, 2017 <http://www.faa.gov/airports/runway_safety/hotspots/hotspots_list/>.*

[2] *FAA Runway Incursion Database, accessed Oct. 12, 2017 <http://www.asias.faa.gov/pls/apex/f?p=100:28:0::NO:28::>.*

Geometry Requirements

FAA AC 150/5300-13A has multiple criteria in the design of taxiways. These geometry criteria are as follows:

- Three Node Concept: The three-node concept means that any taxiway intersection has no more than three choices – ideally left, straight, and right. Any more decision points make it potentially confusing to a pilot and does not allow for the proper placement of airfield markings, signage, and lighting. The three-node concept helps pilots maintain situational awareness.
- Taxiway Intersection Angles: Taxiway intersections are preferred to be 90-degrees whenever possible. Standard angles including 30, 45, 60, 90, 120, 135, and 150 degrees are preferred over other, non-standard, angles.
- Wide Expanse of Pavement: Wide pavements require placement of signs far from the pilot's eye which can be missed during low visibility conditions and should be avoided. This is especially critical at runway entrance points.
- Limit Runway Crossings: Limiting runway crossings reduces the opportunity for human error and reduces air traffic controller workload.
- Avoid "High Energy" Intersections: These intersections are located in the middle third of runways. This portion is where the pilot can least maneuver to avoid a collision.
- Runway Intersection Angles/Increase Visibility: Right (perpendicular) intersection angles between taxiways and taxiways, and taxiways and runways provide the best visibility to the left and right for a pilot. A right angle at the end of a parallel taxiway is a clear indication of approaching a runway. Acute-angle runway exits (rapid-exit taxiways) provide for greater efficiency in runway usage but should not be used as a runway entrance or crossover point. At GSP, this includes Taxiways D, E, F, and G.
- Avoid "Dual Purpose" Pavement: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
- Direct Access: Taxiways leading directly from an apron to a runway without requiring a turn can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidentally enters a runway.
- Multiple Taxiway Crossings Near Runway: A taxiway crossing a high-speed taxiway or multiple taxiways crossing each other between the hold line and the runway could cause confusion, additional time on the runway, and wrong turns/loss of pilot situational awareness.
- Taxiway Intersecting Multiple Runways: Taxiways must never coincide with the intersection of two runways. This creates a large expanse of pavement making it difficult to provide proper signage, marking, and lighting. These could lead to pilot loss of situation awareness and potential wrong runway use.
- Aligned/Inline Taxiway: An aligned taxiway is one whose centerline coincides with a runway centerline. This leads taxiing aircraft into direct line with aircraft landing or taking off therefore closing the runway for other traffic and potentially causing loss of situational awareness. Existing aligned taxiways should be removed as soon as practicable.

- **"Y" Shaped Taxiway Crossing a Runway:** Any runway crossing, or runway exit that requires a pilot to make a decision prior to exiting the runway may cause a delay in the aircraft existing the runway and loss of situational awareness.
- **Multiple Runway Thresholds in Close Proximity to One Another:** If possible, safety areas of runway ends should not overlap, since work in the overlapping area would affect both runways. Configurations where runway thresholds are closer together should be avoided, as they can be confusing to pilots, resulting in wrong-runway takeoffs. The angle between extended runway centerlines should not be less than 30 degrees to minimize confusion.
- **Short Taxi Distance:** A short distance between the terminal and the runway requires flight crews to complete the same number of checklist items in a shorter timeframe and requires more heads-down time during taxi. Many of the event reports mentioned that the flight crew members were rushing to complete their checklists or to expedite their departures.
- **Taxiway Stubs:** Short taxiway stubs including overlapping holdlines or holdlines too close together to accommodate the length of an aircraft can create confusion and may cause runway incursions or accidents.
- **Unexpected Holdlines:** Holdlines located on a parallel taxiway or other unexpected location are more likely to be overlooked and cause a runway incursion or accident and should be avoided.
- **Intersection Departures:** Airports with a single runway layout were not immune to airplanes taking off on the wrong runway, especially when intersection departures were made. In these events, the flight crew taxied onto the runway and turned in the wrong direction, taking off 180 degrees from the intended direction.

The following elements or contributing factors are historically associated with wrong runway uses and should have the highest priority in resolving: [3,4]

- Multiple runway thresholds located in close proximity to one another.
- A short distance between the airport terminal and the runway.
- A complex airport design.
- The use of a runway as a taxiway.
- A single runway that uses intersection departures.
- A single taxiway leading to multiple runways.
- More than two taxiways intersecting in one area.
- A short runway (less than 5,000 feet).
- Joint use of a runway as a taxiway.

Table 5-11 shows potential geometry issues at GSP by geometry requirement.

[3] *Wrong Runway Departures, Aviation Safety Information Analysis and Sharing, July 2007.*
[4] *Wrong Runway Departures, FAA Runway Safety, September 2009, accessed Feb. 3, 2016 <https://www.faa.gov/airports/runway_safety/publications/media/wrong%20runway%20FINAL%20draft%20sept09.pdf>.*

Table 5-11: Geometry Issues at GSP

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Three node concept	None	None
Taxiway intersection angle	None	None
Wide expanse of pavement	Taxiway E/F/L4	None
Runway crossings	None	None
High energy intersections	None	None
Increase visibility	None	None
Dual purpose pavement	None	None
Direct access	L2-D, L4-F	None
Multiple taxiways crossing	None	None
Taxiway intersecting multiple runways	None	None
Aligned taxiway	None	None
Y-Shaped Runway Crossing	None	None
Multiple Runway Thresholds in Close Proximity	None	None
Short Taxi Distance	None	None
Taxiway Stubs	None	None
Unexpected Holdline	None	None
Intersection Departure	None	None

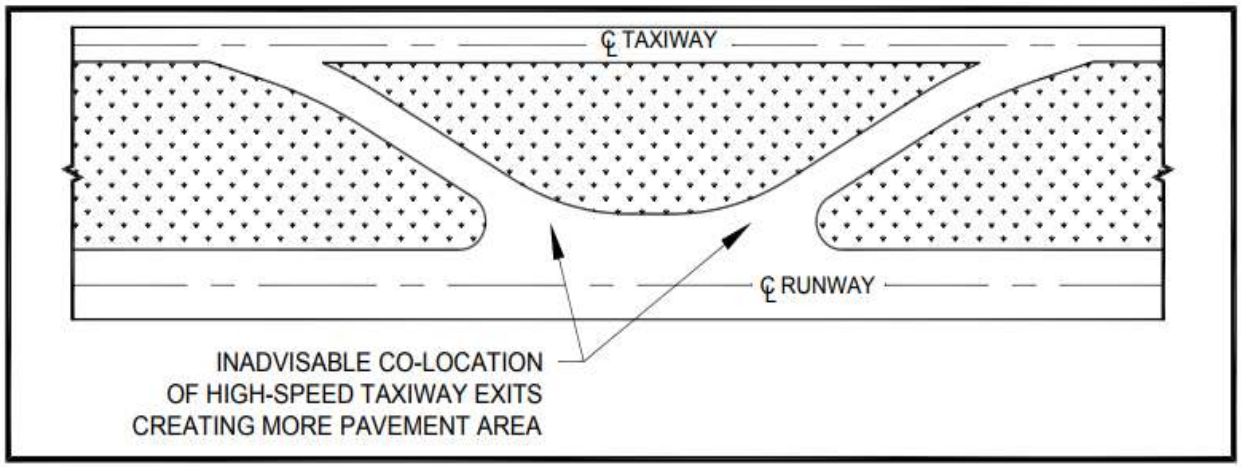
Source: McFarland Johnson Analysis, 2017.

Recommendations: Decouple the terminus of Taxiway E and Taxiway F on Taxiway L as well as remove the potential for direct apron to runway access provided by the Taxiway L-4/F connection.

Rapid-Exit Taxiway Design

Rapid-exit taxiways (also called high-speed exit taxiways and acute-angled taxiways) are designed to allow an aircraft to exit a runway without having to decelerate to typical taxi speeds. This enables aircraft to reduce runway occupancy time, thereby increasing the capacity of the runway, as well as reduce fuel consumption during taxi. FAA design guidance suggest the optimal centerline alignment for a rapid-exit taxiway is 30 degrees off the runway centerline alignment and that multiple intersecting taxiways with acute angles can create pilot confusion and lead to improper positioning of taxiway signage, as shown in **Figure 5-4**. While all rapid-exit taxiways at GSP (Taxiways D, E, F, and G) are 30-degrees from runway centerline, two (Taxiways E and F) terminate on Taxiway L at a common point. This condition creates a wide expanse of pavement on Taxiway L which is exacerbated by the Taxiway L and L4 intersection in the same area. There is also the potential for direct apron to runway access between the transient apron, Taxiway L4, and Taxiway F.

Figure 5-4: Inadvisable Rapid-Exit Taxiway Design



Source: FAA AC 150/2300-13A, Airport Design, Figure 4-20

Recommendations: Decouple the terminus of Taxiways E and F on Taxiway L to better adhere to FAA design standards.

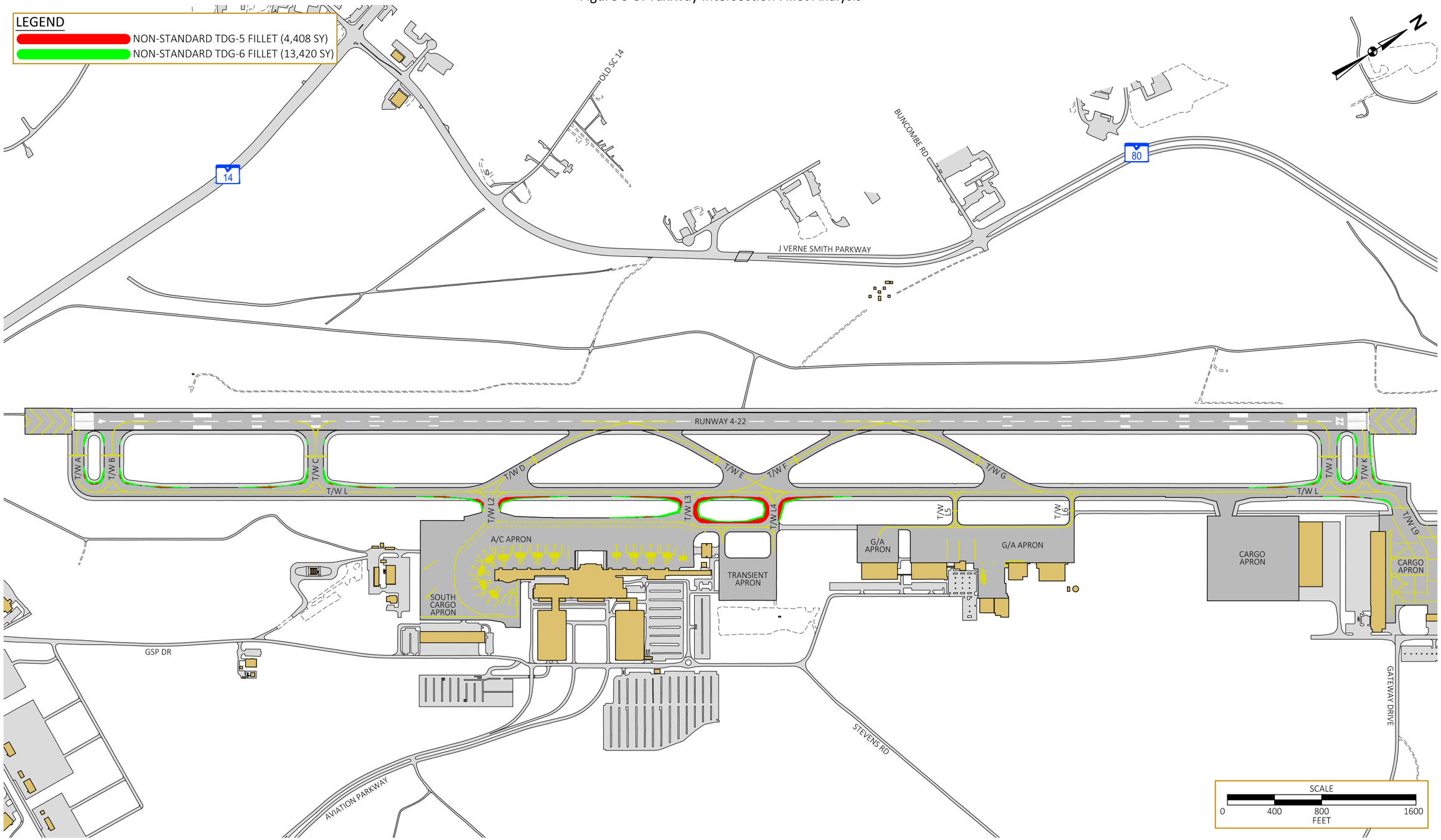
Intersection Fillet Requirements

Taxiway intersection fillets are required on the inside of a taxiway curve to permit the turning of aircraft while still maintaining the TESM. Taxiway fillets are designed in relation to the centerline of the curve, and therefore, the location of the centerline marking. Like other taxiway design standards, taxiway intersection fillet dimensions are based upon the most demanding taxiway design group anticipated to utilize a particular intersection. Based on guidance available from the FAA Advisory Circular AC 150/5300-13A, Change 1, **Figure 5-5** explores the ability of the existing taxiway infrastructure to meet the fillet design standards for existing and future critical aircraft.

Runway accessible Taxiways A, B, C, D, E, F, G, J, and K all meet TDG-5 fillet design requirements, though pavement additions would be required to facilitate TDG-6 movements on Taxiway A, B, C, J, and K. Taxiway L2, L3, and L4 would all need additional pavement to support TDG-5 movements, though only L2 is likely to be utilized by aircraft of TDG-5 size. In the future, only TDG-3 sized aircraft are anticipated on the mid to north portions of the air carrier apron, with possible larger aircraft activity utilizing the south portion of the apron. Cargo aircraft are expected to relocate to a new cargo facility on the north side of the airfield. Taxiways L5 and L6 are not expected to ever facilitate movements by TDG-5/6 aircraft and are well designed to support the variety of GA traffic accessing the GA aprons.

Recommendations: Maintain TDG-5 capable taxiway routes and improve fillet connections where necessary to support 747-8F aircraft operations. Maintain TDG-5 compliant taxiway fillets at all other intersections except for those intended for use solely by smaller aircraft.

Figure 5-5: Taxiway Intersection Fillet Analysis



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\FILLET ANALYSIS.dwg

This page has been intentionally left blank.

5.2.10. Airfield Lighting and Signage

Approach Lighting

The existing precision approach to Runway 4 is equipped with a 2,400-foot high intensity approach lighting system with centerline sequenced flashing lights (ALSF-2) and Runway 22 is equipped with 2,400-foot medium intensity approach lighting systems with runway alignment indicator lights (MALSRs).

The current approach lighting systems on Runways 4 and 22 meet the standards for ILS category (CAT) I approaches and meet existing needs at the Airport. Runway 4 also has a CAT II/III ILS approach. Should a CAT II/III ILS approach be sought for Runway 22 in the future an upgrade from the existing 2,400-foot MALSR system to a 2,400-foot ALSF-1 or ALSF-2, similar to that supplementing the Runway 4 approach, would be recommended.

Recommendations: Upgrade the existing Runway 22 MALSR to ALSF-2 to support lower approach minima to Runway 22.

Runway and Taxiway Lighting

High intensity runway edge lights (HIRLs) are provided on Runway 4-22 and all lighted taxiways are currently equipped with high intensity taxiway edge lights (HITLs). Airfield lighting is controlled by the on-site Airport electric vault with ample capacity and backup power for operational reliability. These systems are sufficient to adequately support Airport operations through the planning period.

Recommendation: No improvements required to runway and taxiway lighting systems.

Airfield Signage

The existing taxiway signage at the Airport does not match the preference for taxiway designations reflected in Figure 1a of FAA Engineering Brief No. 89, *Taxiway Nomenclature Convention*. Reconfiguration of taxiway signage may be appropriate and should be review with other compatible projects, like runway or taxiway rehabilitation projects.

Recommendation: A review of existing taxiway signage, considering all applicable FAA guidance, should be completed as part of future airfield pavement projects.

5.2.11. Visual Approach Aids

Both Runway 4 and Runway 22 are equipped with a 4-light precision instrument approach path indicator (PAPI) with a standard three-degree glide path. The PAPI is located to the left of Runway 4 and to the right of Runway 22. These systems provide visual glide slope guidance to pilots on approach to the runway ends.

Recommendation: No improvements required to visual approach aids at GSP.

5.2.12. Airfield Facility Requirements Summary

Several requirements for airside facilities have been discussed throughout this section. A summary of the key requirements identified can be found in **Table 5-12**. Geometry issues are identified in Table 5-11.

Table 5-12: Summary of Airside Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
Pavement Management	Unable to provide structurally sound pavement for forecasted aircraft mix throughout the 20-year horizon.	Provide structurally sound pavement fore forecasted aircraft mix throughout the 20-year horizon.	Taxiway L Rehabilitation Runway 4-22 Asphalt Rehabilitation Reconstruct Itinerant Apron Localized PCC Repairs and Joint Sealing
Runway Length	11,001 FT	11,001 FT	None
Runway Width	150 FT	150 FT	None
Runway Orientation	Meets 95% wind coverage in all conditions	Meet 95% wind coverage in all conditions	None
Runway Designation	4-22	4-22	None
Runway Safety Areas	Runway 4-22 500 FT wide 1,000 FT past RW ends Limited ability to meet grade requirements	Runway 4-22 500 FT wide 1,000 FT past RW ends Full ability to meet grade requirements	Meet grade requirements
Runway Object Free Area	Runway 4-22 800 FT wide 1,000 FT past RW ends Meets clearance requirements	Runway 4-22 800 FT wide 1,000 FT past RW ends Meets clearance requirements	None
Runway Protection Zone	Runways 4 & 22 1,000 FT Inner Width 2,500 FT Length 1,750 FT Outer Width Airport ownership/ Right-of-way/ Easement	Runways 4 & 22 1,000 FT Inner Width 2,500 FT Length 1,750 FT Outer Width Airport Ownership/ Right-of-Way/ Easement	None

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
Runway Pavement Markings	Precision Instrument Markings	Precision Instrument Markings	None
Taxiways[1]	Full Length Parallel Ample Entry/Exits Meets TDG-5/6 Meet ADG VI standards Unable to fully provide TDG-5/6 Fillets Does not meet geometry	Full Length Parallel Ample Entry/Exits Meets TDG-5/6 Meet ADG VI standards Provide TDG-5/6 Fillets Meets geometry	Improve Intersection Fillets Correct Geometry
Approach Lighting	Runway 4 2,400 FT ALSF-2 Runway 22 2,400 FT MALSR	Runway 4 2,400 FT ALSF-2 Runway 22 2,400 FT ALSF-2	Runway 22 2,400 FT ALSF-2
Airfield Lighting	Runway 4-22 – HIRLs	Runway 4-22 – HIRLs	None
Airfield Signage	Meets Standards	Meet Standards	None
Runway Visual Aids	Runway 4 – PAPI Runway 22 – PAPI	Runway 4 – PAPI Runway 22 – PAPI	None
Instrument Approaches	Runway 4 – ILS/LOC (CAT I, II, and III) Runway 4 –GPS - LPV Runway 22 – ILS/LOC (CAT I) Runway 22 –GPS - LPV	Runway 4 – ILS/LOC (CAT I, II, and III) Runway 4 –GPS - LPV Runway 22 – ILS/LOC (CAT II and III) Runway 22 –GPS - LPV	CAT II/III approach to Runway 22

Note: 1/ Taxiways A/B and J/K do not provide adequate separation for dual use of ADG VI aircraft.
Source: McFarland-Johnson Analysis, 2017

5.3. PASSENGER TERMINAL FACILITY REQUIREMENTS

This section addresses the methodology, assumptions, and general planning-level factors used to analyze facility requirements for key functional areas of the GSP passenger terminal. Requirements were analyzed based on a multitude of factors and compared to growth triggers identified in the Forecasts presented in Chapter 3 and the 2010 Terminal Area Study discussed in Section 1.3.2 of this report. The primary tool used to model various terminal spatial requirements was ACRP Report 25, *Airport Passenger Terminal Planning and Design, Volume 2: Spreadsheet Models and User's Guide (Model)*. Additionally, guidelines published in the following publications were included:

- International Air Transport Association's (IATA) Airport Development Reference Manual (ADRM, 10th Edition);
- FAA AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*;

- FAA AC 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-Hub Locations*; and
- FAA AC 150/5300-13A, *Airport Design*.

5.3.1. Existing Passenger Terminal

As discussed in Section 2.4.1 of this report, the passenger terminal recently underwent a major renovation and revitalization effort focused on increasing capacity, improving efficiency, and elevating the aesthetics of the terminal building and its surroundings. This undertaking was planned in the 2010 Terminal Area Study discussed previously and programed in the years that followed. This study is used as a reference in the following sections to compare calculated spatial requirements with prior planning analysis. Gaps identified between existing facilities and future need will be documented as recommended future facility improvements.

5.3.2. Methodology

Utilizing the ACRP Model and FAA and industry standards guidance listed above, the following passenger processing functions were examined:

- Terminal Curb Length
- Passenger Check-In and Ticketing
- Outbound Baggage Screening and Make-Up
- Passenger Security Screening Checkpoint
- Concourse Circulation/Concessions
- Passenger Lounges/Holdrooms
- Concourse Gates, Passenger Boarding Bridges and Terminal Apron
- Inbound Baggage Handling and Baggage Claim
- Other Terminal Support Functions

The terminal building analysis was performed under two primary scenarios: standard service by typical air carriers with operational and enplanement totals as outlined in Section 3.8 of this report and the plausible terminal spatial requirements should the Airport reach two million annual enplaned passengers (MAEP). The two MAEP scenario is considered for two reasons: (1) The 2010 terminal study anticipated two MAEP to be a triggering threshold for what that study considered to be Phase II of the terminal growth plan and (2) two MAEP could be achieved through this study's forecast should the forecast scenarios, as discussed in Section 3.4.6, be triggered.

Additionally, to provide some insight into plausible requirements beyond the planning horizon of this master plan, and presumable two MAEP, spatial requirements for out years 2045, 2055 and 2065 were also contemplated and are presented in the results of the analysis.

Application of the Model under these scenarios is presented in the following section.

Application of ACRP Model

The ACRP Model is designed to determine terminal requirements by functional area based on historical and forecasted annual enplanements, departures, and gates. The Model uses these inputs (along with a variety of assumptions) to identify peak hour activity. From this point, the

Model relies on peak hour activity levels to produce space requirements that can accommodate demand as it grows. In this way, the Model serves as "top down" analysis, starting with annual demand to estimate peak activity demand.

Facility requirements at GSP were determined using the assumptions shown in **Table 5-13** for peak hour departures, which corresponds to the baseline forecast assessment presented in Section 3.4.7 of this report and expresses steady growth in annual arriving and departing (A&D) passenger activity. Additionally, the two MAEP scenario is explored utilizing the assumptions inherent to the peaking characteristics presented in the forecast.

Table 5-13: Aircraft Seats and Scheduling Peak Characteristics

Departures and Passengers	2017	2022	2027	2037	2 MAEP
Peak Hour Departing Passengers	622	725	818	1,010	1,226
Daily Departing Passengers	3,109	3,624	4,088	5,050	6,128
Annual Arriving/Departing Passengers	1,014,611	1,182,700	1,333,823	1,648,052	2,000,000

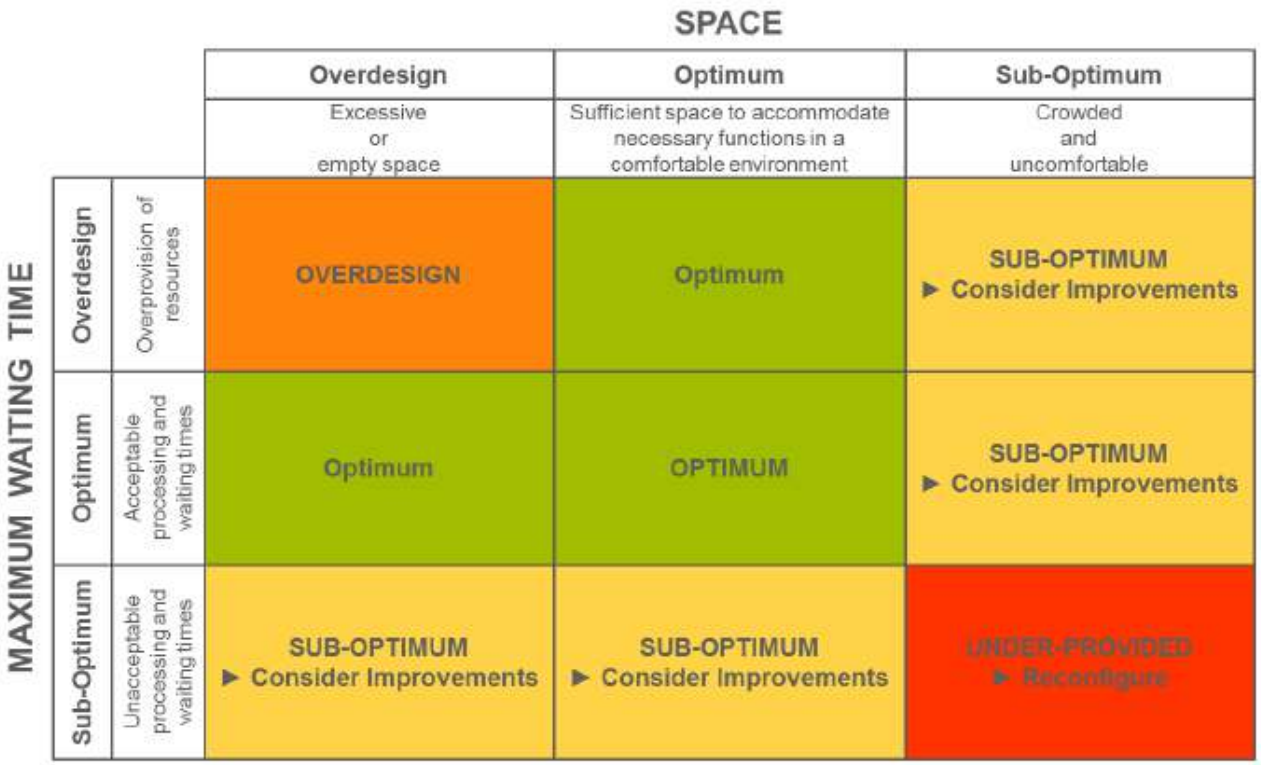
Source: McFarland Johnson, 2017.

Level of Service (LOS) Standards

The IATA has published a comprehensive guide with standards for planning various passenger processing functions for airport terminal buildings. These standards reflect the dynamic nature of terminal operations and throughput (passenger processing rate from check-in through enplanement) and have the goal of increasing infrastructure efficiency. The Airport Development Reference Manual (ADRM) sets forth two variables, which jointly dictate a Level of Service (LOS): space and maximum waiting time. This space-time concept is the LOS framework for measuring the performance of passenger processing through each functional area of an airport terminal building and corresponding waiting areas. The measurement yields an indication of existing performance within four categories: under-provided, sub-optimum, optimum, and over-design.

Figure 5-6 illustrates how the space-time concept of LOS performance in airport terminals is evaluated. The space axis defines the amount of space available per occupant, and the time axis denotes the maximum waiting time for passengers in the queue. The objective of the space-time concept in ADRM is the provision of optimum passenger facilities and the avoidance of both over- or under-providing for passengers and the airport, airline, regulatory, or tenant staff doing the work of processing arriving and departing passengers to and from aircraft.

Figure 5-6: IATA Level of Service Performance Categories



Source: IATA and ACI, 2014.

5.3.3. Assumptions

This section summarizes the assumptions utilized for the assessment of the existing Airport terminal building.

Percentage of Originated Passengers

For purposes of analyzing passenger terminal space requirements, it is assumed that 100 percent of enplaned passengers are originating at GSP. The originating passenger percentage is used to determine the number of passengers to be processed through check-in/ticketing and security screening, along with associated demands on outbound baggage functions, holdroom usage, and gate/boarding area egress.

Vehicle Demand at Terminal Curb

Vehicle demand in the Model is based on the range of vehicle types used by passengers as ground transport to an airport for departing flights. These include everything from private automobiles carrying one to three passengers to tour buses carrying large groups of passengers. For this analysis, a focus was placed on private autos, taxis/transportation network companies (TNC), limousine/executive cars, hotel shuttles, and busses. Table 5-14 illustrates the assumed breakdown of existing peak vehicle demand at the curb, dwell time assumptions, and passenger per vehicle assumptions, all of which are integral to the calculation of terminal curb requirements.

Table 5-14: Peak Hour Vehicle Assumptions

Vehicle Type	Peak Hour Vehicles	Peak 15 Min. Demand (MIN)	Dwell Time (MIN)	Total Passengers by Vehicle
Private Auto	396	158	4.5	1.5
Taxi and TNC	28	11	2	1
Limousine/Executive	12	5	3	1
Hotel Shuttle	8	3	4	2.5
Bus	5	2	3	10
Remote Parking	6	2	4	10
Total	455	181	n/a	n/a

n/a – not applicable

Source: McFarland Johnson Analysis, 2017

The number of vehicles assumes that private autos will average 1.5 passengers each, taxis/TNC will transport 1.0 passenger per vehicle, hotel shuttles will carry 2.5 passengers, buses will average 10 passengers, and parking shuttles will average 5 passengers. The Model then applies an assumption that a peak 15-minute period will require the curb to accommodate about 179 vehicles, each making one stop and dwelling from three to four and a half minutes for all vehicles except busses, which can require up to ten minutes and parking shuttles which can require up to five minutes. The Model requirements for the terminal curb are in linear feet (LF). The existing curb length is approximately 500 LF along the terminal curb front and another 500 LF along the vehicular island curb, providing approximately 1,000 LF in total. Of this, about 400 LF adjacent to the terminal ticketing lobby and 400 LF is adjacent to the baggage claim lobby, the remaining 200 LF of curb front is centrally located between both the ticketing and the baggage claim lobbies. To account for the bifurcated curb design and the operational conditions inherent to that design (a preference for the terminal-side curb over the pedestrian island curb, and limits on vehicular flow resulting from pedestrian crossings), calculated curb requirements will be elevated by 20 percent.

Passenger Check-in /Ticketing

Passenger check-in/ticketing includes the functions of full-service staffed airline counter positions, self-serve kiosks, active check-in area, passenger queue area, airline ticket office areas, circulation area, and public restrooms accessible from the ticketing lobby. Assumptions for these areas include the following:

- 60 percent of peak hour passengers could be experienced in the peak 30-minute period.
- 40 percent of passengers use check-in and ticketing facilities.
- Average passenger processing time at the counter or kiosk is three minutes.
- Existing ticket counter area roughly 5,000 square feet (SF).
- Existing ticketing kiosk area is roughly 2,700 SF.
- Existing airline ticket office area is roughly 8,600 SF.
- Existing restrooms accessible to the check-in area total roughly 2,650 SF.

- Existing circulation in and around the previously listed passenger check-in and ticketing facilities total roughly 7,300 SF.

Outbound Baggage Make-Up and Screening

Outbound baggage screening and make-up functions includes operations by Transportation Security Administration (TSA) to screen checked baggage and airline staff to collect and disperse bags to carts and the appropriate aircraft prior to departure. For outbound baggage volume the following assumptions in 5-34Table 5-15 were used.

Table 5-15: Outbound Baggage and Screening System Assumptions

Item for Analysis	Assumption
Peak Hour Passengers Checking Bags [1/]	75 Percent
Checked Bags per Passenger [2/]	1 Bag
Bag Size – Standard	95 Percent
Bag Size – Oversized	5 Percent

[1/] Number of checked bags remains constant over the period, should the trend of reduced checked baggage not continue.

[2/] It has been identified that certain legacy airlines are currently observing lower "checked bag per passenger" quantities; for planning purposes, the higher quantity has been used.

Source: McFarland Johnson Analysis, 2016.

The Model assumes between six and 13 departures per peak hour across the planning period, and that the volume of checked baggage can be accommodated utilizing 14 to 26 baggage carts. The Model suggests that each cart requires 600 square feet of space. An additional 20 percent of square footage is included for baggage train circulation and 15 percent for mechanical and support space.

In terms of Explosive Detection System (EDS), On-Screen Resolution (OSR), and Explosives Trace Detection (ETD) equipment requirements, the analysis assumed a Level 1 EDS screening rate of 220 bags per hour, with an alarm rate of 20 percent. Level 2 OSR processing ration was set at 60 bags per hour. For Level 3 ETD screening, the TSA suggests 24 bags per hour per operator.

Baggage screening space requirements contained in the Model were utilized here, and are as follows:

- Level 1 Area: 500 square feet per EDS unit
- Level 2 Area: 40 square feet per OSR station
- Level 3 Area: 100 square feet per ETD station

An additional 35 percent of space is added for circulation area, and 15 percent to allow for future equipment changes and any required reconfiguration or renovations.

Passenger Security Screening Checkpoint

This section discusses the assumptions utilized to analyze the future demand for security screening of departing passengers. The assumed processing rate for the analysis is 200 persons per hour for a two-lane screening module configuration through the 20-year planning horizon. For forecast

years beyond 2040, this rate was increased to 400 passengers per hour to consider the trend toward less invasive security procedures and security protocols based on biometric identification, pre-clearance, and other developing technologies.

Although, TSA recommends 2,800 square feet of space for a two-lane screening module, GSP currently accommodates two lanes within roughly 2,000 square feet. As such, this ratio was maintained for future facility needs.

The percentage assumed for non-passenger traffic, such as employees and crew, is ten percent, which was added to the design peak hour passenger screening demand and is based on recent experience at other airports.

As with other functional areas, allowances were also included for future equipment changes (ten percent) or reconfigurations and TSA support space (12 percent).

Concourse Circulation/Concessions

In terms of area required for passenger circulation on the secure side of the terminal building, the Model considers whether the Airport operates as a hub for connecting passengers, the type of concourse design (e.g., single- versus double-loaded, with or without moving walkways), and includes assumptions for percentage of the concourse length that is usable (e.g., concourses with holdrooms at the end are not 100 percent usable). For this analysis, a single-loaded concourse with no moving walkways and no connecting flights was used, making 100 percent of the concourse usable by passengers.

Terminal concessions include both non-secure and secure area retail establishments to service departing and arriving passengers. For this assessment, it is assumed that 20 percent of peak hour passengers will utilize pre-secure concessions and 80 percent of peak hour passengers will patronize post-secure area concessions. The model makes the following assumptions to calculate spatial requirements:

- Food and beverage-based concessions require seven square feet per peak hour passenger
- Retail based concessions requires 3.5 square feet per peak hour passenger
- Service based concessions require 0.5 square feet per peak hour passenger
- A multiplier of 15 percent is used to account for support space for food and beverage concessions
- A multiplier of five percent is used to account for support space for retail concessions
- Internal circulation area allowance of 10 percent is also included for terminal building concession areas.

Passenger Lounges/Holdrooms

Holdroom space typically accounts for seating a certain percentage of passengers, with the remaining passengers either not in the holdroom area or standing. For this analysis, it was assumed that 85 percent of passengers are in the hold room area of which 80 percent of passengers are seated. The analysis assumed 15 square feet per seated passenger and ten square feet per standing passenger. The Model also includes some flexibility to account for amenities (e.g., children's play area, telephones, work areas, charging stations, etc.), and high utilization and

holdroom sharing, when the holdroom is utilized for passengers waiting for more than one flight or is shared between gates.

The model recommends approximately 230 square feet to accommodate one airline gate podium and agents, as well as 240 square feet for boarding corridor space per gate. Both are added to holdroom space requirements in the analysis.

Allowances for amenities, circulation, and restrooms are assumed to be five percent, 30 percent, and eight percent, respectively.

Inbound Baggage Handling & Baggage Claim

Inbound baggage handling includes the unloading of baggage from aircraft and transferring them to the baggage claim unit for circulation to the baggage claim hall. The model calculates baggage claim requirements assuming that a certain percentage of passengers will deplane in a peak 30-minute period. For GSP, it is assumed that 100 percent of passengers terminate at the Airport. As previously noted, it is also assumed that 75 percent of passengers will check one bag. Additionally, the following assumptions are made:

- A multiplier of 105 percent is applied to the number of passenger checking bags to account for meters and greeters
- 1.3 linear feet of claim is required for each person in the claim lobby
- Typical carousel unit frontage at GSP is 110 linear feet
- 14 square feet per person in the baggage claim lobby is required to provide for adequate queuing, bag retrieval, and circulation space
- Baggage claim area is increased by 10 percent to provide for baggage services office
- Baggage claim area is increased by 15 percent to provide for meet and greet area
- Baggage claim area is increased by 25 percent to provide for circulation space
- Baggage claim area is increased by 15 percent to provide for restroom facilities.

To account for inbound baggage handling area the following assumptions are made:

- Take off belts require 850 square feet of space each.
- Baggage train circulation requires 1,275 square feet of per take off belt.
- 255 square feet per take off belt is provided to account for conveyor belts equipment and other miscellaneous equipment.

Other Terminal Support Facilities

The final consideration of passenger terminal functional areas includes allowances for the following:

- Airline Operations: two percent of calculated departure/arrival areas
- Ground Handling Services: four percent of calculated departure/arrival areas
- Airport Operations and Maintenance: five percent of calculated departure/arrival areas
- Facilities Support and Services: 1.5 percent of calculated departure/arrival areas
- Building Structure Allowance: six percent of net departure/arrival/secure areas
- Vertical Circulation: seven percent of net departure/arrival/secure areas

- Mechanical/Electrical/Utility: 12 percent of net departure/arrival/secure areas
- Allowance for Other Tenants/Configurations: four percent of total terminal area

Concourse Gates, Passenger Board Bridges and Terminal Apron

To determine the required number of concourse gates, and subsequently passenger boarding bridges and terminal apron requirements, the model employs a departure per gate approach which assumes four daily departures per gate until 2040 after which time it slowly transitions to 4.5 average daily departures in 2065. The two million annual passengers scenario is modeled using four average daily departures per gate.

5.3.4. Results of Analysis

The results of the terminal capacity assessment are summarized in Table 5-16.

Table 5-16: Terminal Functional Area Requirements

Functional Area	Existing Facility	Ultimate Requirement	2 MAEP	Beyond 2040		
				2045	2055	2065
Annual Enplanements	1,182,700	1,648,052	2,000,000	2,153,123	2,745,443	3,500,708
Peak Hour Enplanements	622	1,010	1,226	1,320	1,683	2,145
Gates	13	+2 Gates	+5 Gates	+6 Gates	+10 Gates	+15 Gates
Curb Length	1,000 LF	+65 LF	+286 LF	+508 LF	+812 LF	+1,202 LF
Check-In/Ticketing						
Staffed Counter Positions	40 Positions	No Change	No Change	No Change	No Change	No Change
Check-In Ticket Area (Counter/Active/Queue)	4,998 SF	No Change	No Change	No Change	+674 SF	+2,175 SF
Kiosks Positions	19 Positions	No Change	No Change	No Change	+5 Positions	+11 Positions
Kiosk Check-In Area (Active/Queue)	2,691 SF	+206 SF	+827 SF	+1,173 SF	+2,211 SF	+3,492 SF
Airline Ticket Office Area	8,631 SF	No Change	No Change	No Change	No Change	No Change
Check-In/Ticketing Circulation Area	7,300 SF	No Change	No Change	No Change	No Change	+672 SF
Restrooms	2,654 SF	No Change	+105 SF	+313 SF	+1,137 SF	+2,129 SF
Outbound Baggage Screening and Make-Up						
Level 1 EDS Units	4	No Change	+ 1 Unit	+ 1 Unit	+3 Units	+4 Units
Level 2 OSR Stations	2	+1 Station	+2 Stations	+2 Stations	+3 Stations	+4 Stations
Level 3 ETD Stations	2	+1 Station	+1 Station	+1 Station	+2 Stations	+3 Stations
Level 1 EDS Screening Area	2,054 SF	No Change	+446 SF	+446 SF	+1,446 SF	+1,946 SF
Level 2 OSR Screening Area	100 SF	+20 SF	+60 SF	+60 SF	+100 SF	+140 SF
Level 3 ETD Screening Area	400 SF	No Change	No Change	No Change	No Change	+100 SF
Make-Up Area (Including Baggage Train Circulation & Mech. Support Spaces)	15,032 SF	No Change	No Change	No Change	+1,528 SF	+6,496 SF
Passenger Security Screening Checkpoint						
Screening Lanes	4 Lanes	+3 Lanes	+5 Lanes	+2 Lanes	+3 Lanes	+5 Lanes

Functional Area	Existing Facility	Ultimate Requirement	2 MAEP	Beyond 2040		
				2045	2055	2065
Annual Enplanements	1,182,700	1,648,052	2,000,000	2,153,123	2,745,443	3,500,708
Peak Hour Enplanements	622	1,010	1,226	1,320	1,683	2,145
Security Screening Module Area	3,850 SF	+3,150 SF	+5,150 SF	+2,150 SF	+3,150 SF	+5,150 SF
Passenger Queue Area	3,026 SF	+3,519 SF	+4,918 SF	+5,528 SF	+7,880 SF	+10,874 SF
Allowance for Future Equipment Changes	1,524 SF	No Change	+170 SF	No Change	+267 SF	+766 SF
TSA Support Space Area	1,717 SF	+71 SF	+520 SF	+204 SF	+647 SF	+1,036 SF
Passenger Lounges/Holdrooms						
Holdrooms (Seated/Standing/Ticketing/Boarding)	36,950 SF 13 Gates	+ 1,180 SF +2 Gates	+ 8,806 SF +5 Gates	+11,348 SF +6 Gates	+21,516 SF +10 Gates	+34,226 SF +15 Gates
Allowance for Amenities	1,907 SF	No Change	+ 381 SF	+ 508 SF	+ 1,106 SF	+ 1,652 SF
Holdroom Circulation Area	12,600 SF	No Change	+ 1,813 SF	+ 2,614 SF	+ 5,817 SF	+ 9,820 SF
Restrooms	2,910 SF	+140 SF	+750 SF	+ 954 SF	+ 1,767 SF	+ 2,784 SF
Inbound Baggage Handling and Claim						
Baggage Claim Frontage (LF)	321 LF	+ 270 LF	+ 396 LF	+ 451 LF	+ 664 LF	+ 934 LF
Baggage Claim Units	3 Units	+ 2 Units	+ 4 Units	+ 4 Units	+ 6 Units	+ 8 Units
Baggage Claim Unit Area	2,967 SF	+ 2,345 SF	+ 3,481 SF	+ 3,976 SF	+ 5,885 SF	+ 8,315 SF
Passenger Queue & Bag Retrieval Area	8,048 SF	No Change	+ 62 SF	+ 684 SF	+ 3,085 SF	+ 6,141 SF
Baggage Service Office	588 SF	+ 611 SF	+ 868 SF	+ 979 SF	+ 1,411 SF	+ 1,959 SF
Allowance for Meeters/Greeters	2,665 SF	No Change	No Change	No Change	+ 333 SF	+ 1,156 SF
Baggage Claim Area Circulation	4,179 SF	No Change	+ 370 SF	+ 719 SF	+ 2,066 SF	+ 3,781 SF
Restrooms	1,391 SF	+1,420 SF	+ 2,021 SF	+ 2,283 SF	+ 3,293 SF	+ 4,579 SF
Take-Off Belts	3 Unites	+ 2 Units	+ 4 Units	+ 4 Units	+ 6 Units	+ 8 Units
Take-Off Belt Area	2,300 SF	+2,266 SF	+3,242 SF	+ 3,667 SF	+ 5,308 SF	+ 7,396 SF
Allowance for Baggage Train Circulation	5,160 SF	+1,688 SF	+3,153 SF	+ 3,791 SF	+ 6,252 SF	+ 9,385 SF

Functional Area	Existing Facility	Ultimate Requirement	2 MAEP	Beyond 2040		
				2045	2055	2065
Annual Enplanements	1,182,700	1,648,052	2,000,000	2,153,123	2,745,443	3,500,708
Peak Hour Enplanements	622	1,010	1,226	1,320	1,683	2,145
Allowance for Conveyor Belt & Equip.	500	+870 SF	+1,163 SF	+ 1,290 SF	+ 1,782 SF	+2,409 SF
Concourse Circulation/Concessions						
Pre-Secure Concession Area (Service/Support)	4,800	No Change	+240 SF	+ 626 SF	+ 2,119 SF	+ 4,022 SF
Post-Secure Concession Area (Service/Support)	19,200	No Change	+960 SF	+2,503 SF	+8,474 SF	+16,087 SF
Total Terminal Building Area Requirement	N/A	+ 17,756 SF	+ 38,414 SF	+ 46,267 SF	+ 89,918 SF	+149,622 SF

Source: McFarland-Johnson Analysis, 2017.

5.4. ROADWAY ACCESS AND PARKING FACILITY REQUIREMENTS

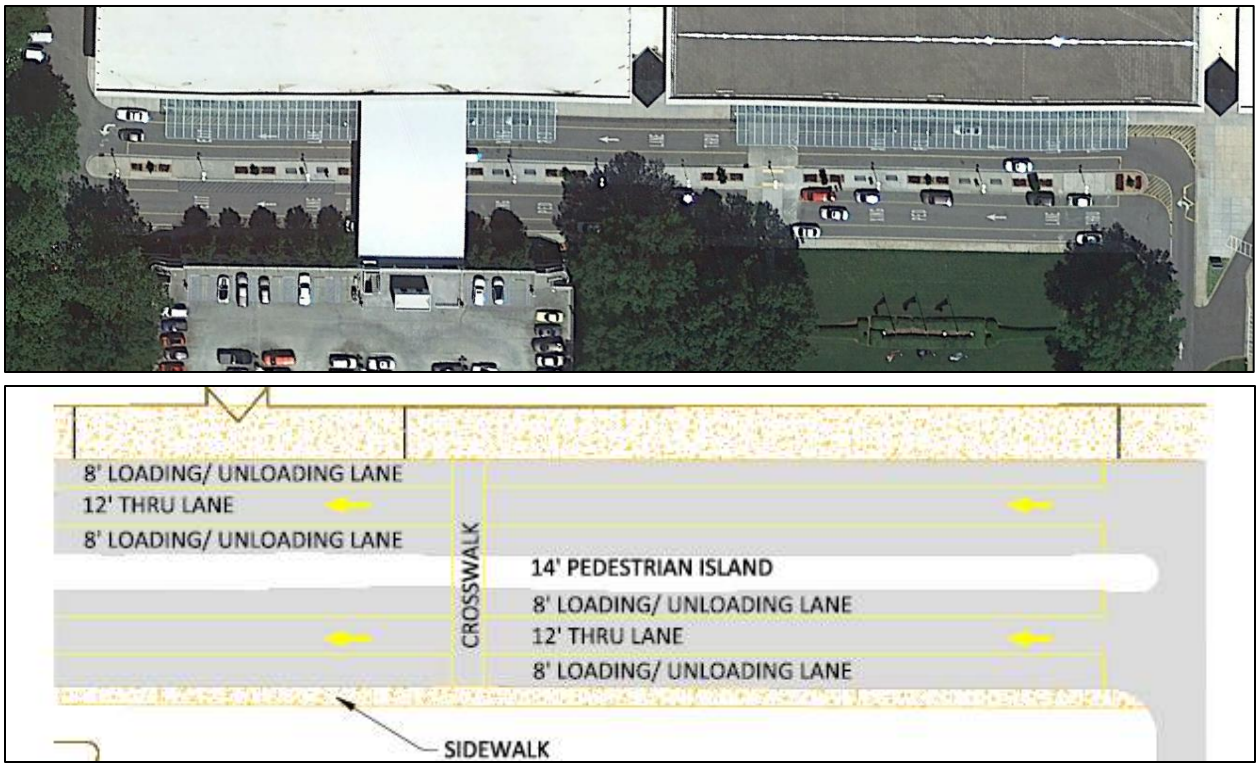
To determine future roadway access and parking facility requirements at GSP, the performance of existing facilities was assessed through detailed review of peak activity vehicular movements about the GSP campus along with daily activity records for each parking lot over a three-year period. This information enables the understanding of traffic profiles during various peak activity periods across an average day as well as typical demands on parking facilities and their peaking characteristics.

5.4.1. Airport Roadway and Circulation Assessment

Existing Airport Entrance Road and Terminal Curb Circulation

The primary Airport entrance road, Aviation Parkway, is comprised of two ingress lanes and two egress lanes divided by a landscaped median. Each lane has a width of 12 feet. At the terminal curb, the two-lane ingress roadway bifurcates and widens to provide a total of six lanes, three on each side of a raised central median. The center lane of each set of lanes are dedicated movement lanes and the outer lanes are for passenger loading/unloading. This provides up to four lanes for passenger unloading/loading all of which provide roughly 500 linear feet when not considering crosswalk spaces. The Airport and its terminal curb circulation roadway can also be access via GSP Drive which connects State Route 41 and Highway 101 through Airport property via Stevens Road and State Road S-42-12. **Figure 2-2** of this report identifies the airport roadway network while **Figure 5-7** depicts the terminal curb layout.

Figure 5-7: Existing Terminal Curb



Source: Google Earth, 2018; McFarland Johnson, 2018.

Traffic Analysis Study Area

The traffic analysis completed as part of this master plan included a study area that incorporated all access routes to the Airport via GSP Drive, Aviation Parkway, and Stevens Road. The I-85 interchange 57 with Aviation Parkway was not included in the study area. Traffic data was collected at the following existing intersections within the study area:

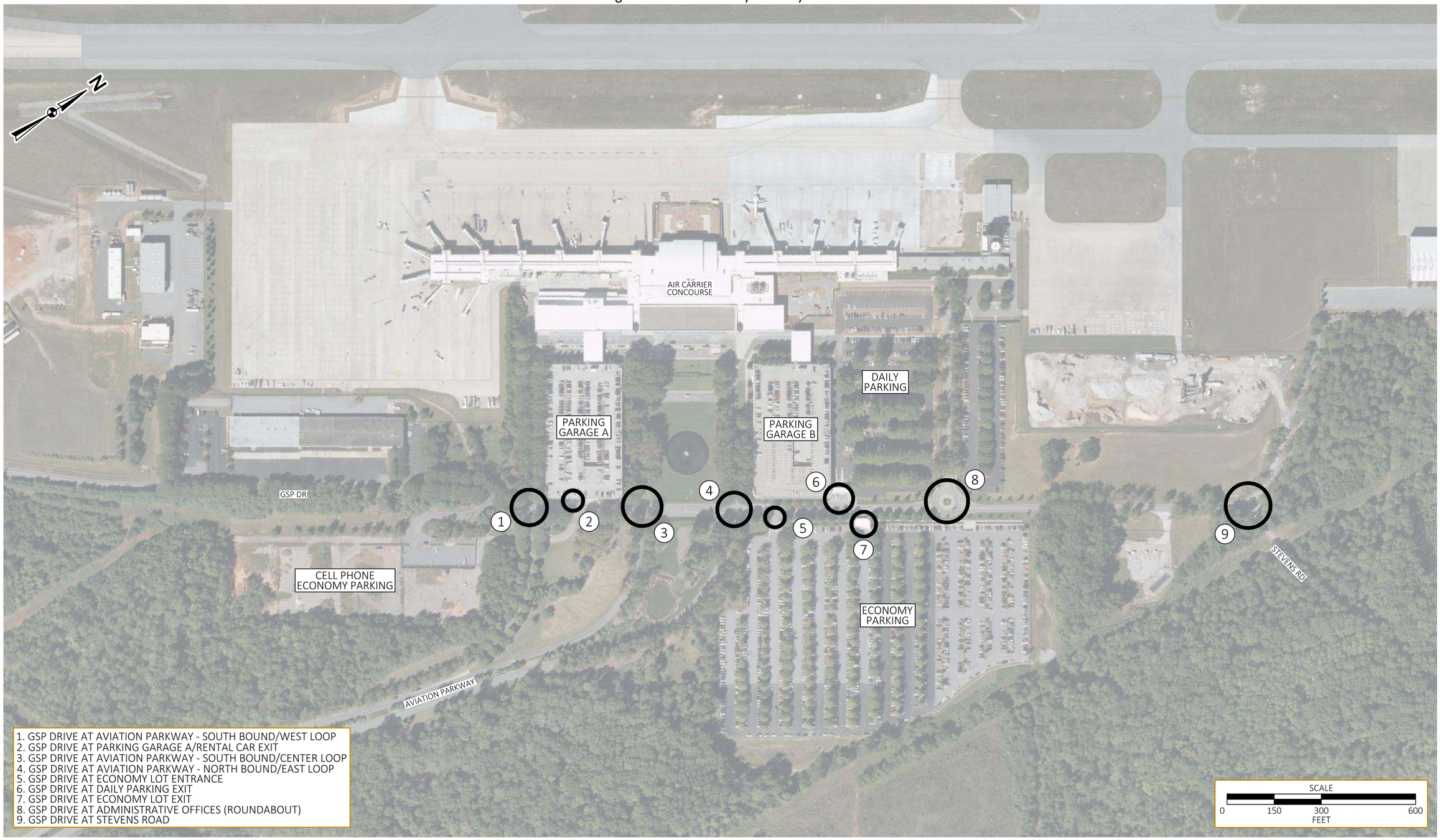
- GSP Drive at Aviation Parkway – South Bound/West Loop *(Un-Signalized)*
- GSP Drive at Parking Garage A/Rental Car Exit *(Un-signalized)*
- GSP Drive at Aviation Parkway – South Bound/Center Loop *(Un-Signalized)*
- GSP Drive at Aviation Parkway – North Bound/East Loop (*Un-Signalized*)
- GSP Drive at Economy Lot Entrance (*Un-Signalized*)
- GSP Drive at Daily Parking Exit (*Un-Signalized*)
- GSP Drive at Economy Lot Exit (*Un-Signalized*)
- GSP Drive at Administrative Offices (*Roundabout*)
- GSP Drive at Stevens Road (*Un-Signalized*)

Figure 5-8 depicts the location of the intersection locations evaluated

Traffic Data Collection

Existing traffic data was collected within the study area including traffic volumes and directional movement, vehicle classifications, airport parking lot volumes, intersection geometry, existing signage and pavement striping. Traffic volumes along the study area roadways were recorded for 24-hours on Tuesday, November 14, 2017 from directional automatic counters in both 15-minute and hourly intervals to determine peak hour timeframes as well as daily traffic volumes on GSP Drive and Aviation Parkway. Manual turning movement counts (TMC) were performed for the study area intersections and recorded 15-minute data intervals during the identified peak timeframes determined from the hourly machine counts. The TMC were video recorded from 6:45 to 9:45 AM and 3:15 to 6:15 PM on Tuesday, November 14, 2017. The TMC data shows that the weekday peak hour traffic in the study area is between 7:30 - 8:30 AM and 8:45 - 9:45 AM in the morning and 4:30 - 5:30 PM in the evening. Existing parking data obtained from the Airport included hourly entering and exiting traffic volumes for each parking lot/garage for the years 2014 through 2017. Traffic volume data collection summary sheets are included in Appendix B.

Figure 5-8: Traffic Analysis Study Area



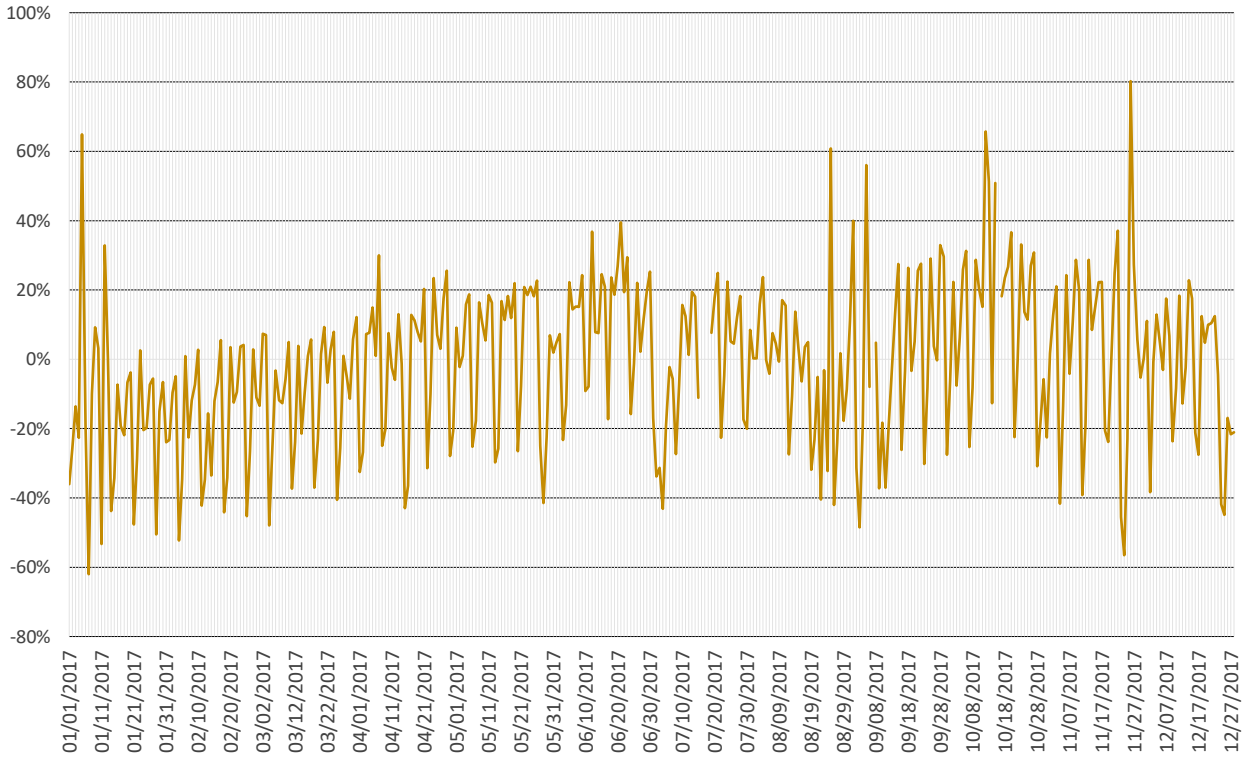
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC STUDY AREA.dwg

This page has been intentionally left blank.

Existing Traffic Volumes

The traffic data collected was used to create traffic volume flow diagrams for the entire study area. Each diagram shows the directional turning movement of traffic by volume at each intersection of study. Utilizing the parking data available, it was determined that the November 14, 2017 traffic activity at the Airport represented a 67th percentile amount of traffic. This indicates an above average, but not overly busy day for traffic at the Airport. **Figure 5-9** shows the daily variation of traffic from the average throughout 2017 based on the parking lot activity. As shown in the graph, the traffic fluctuates daily from 40 percent less than average to 60 percent more than average. After coordination with the Airport, the design team determined that the 90th percentile traffic should be used as the design standard for the roadway assessment and is similar to the design standards applied in typical roadway design projects by municipal departments of transportation. The 90th percentile peak hour traffic volume flow diagrams are included as **Figure 5-10** through **Figure 5-12**.

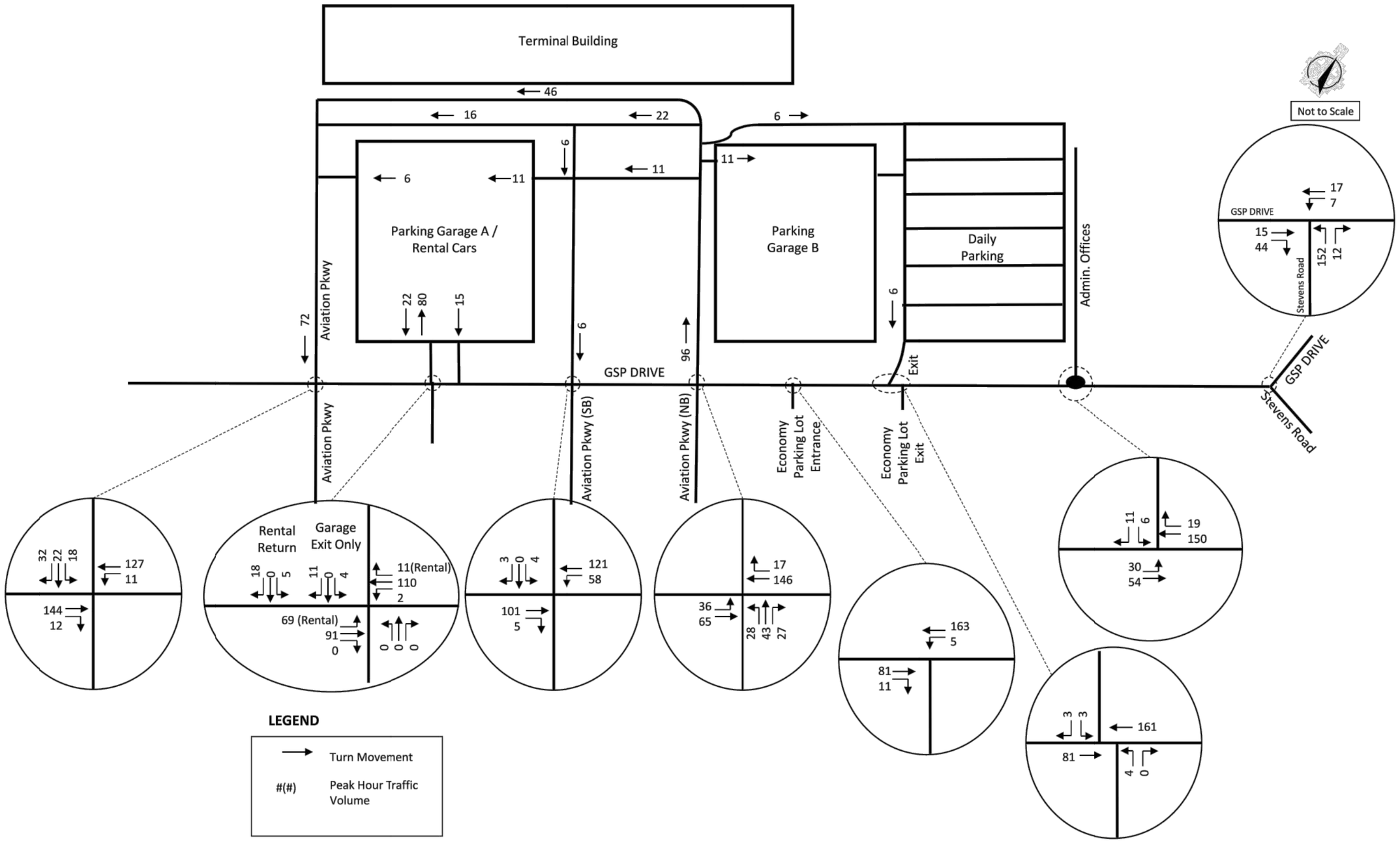
Figure 5-9: 2017 Daily Traffic Variation



Source: McFarland-Johnson Analysis, 2017.

This page has been intentionally left blank.

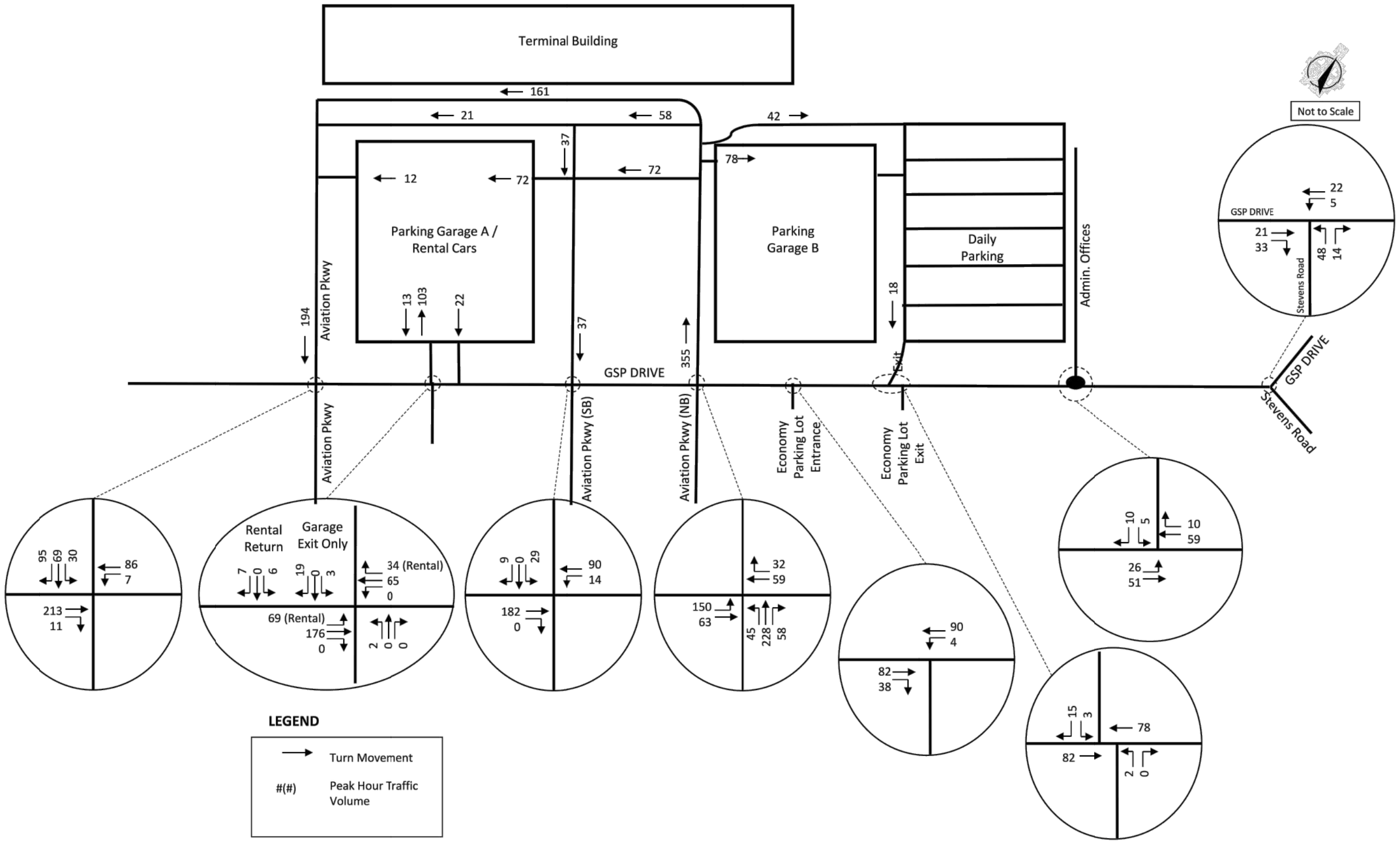
Figure 5-10: 90th Percentile Weekday AM Peak Volumes 7:30 to 8:30



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC.dwg

This page has been intentionally left blank.

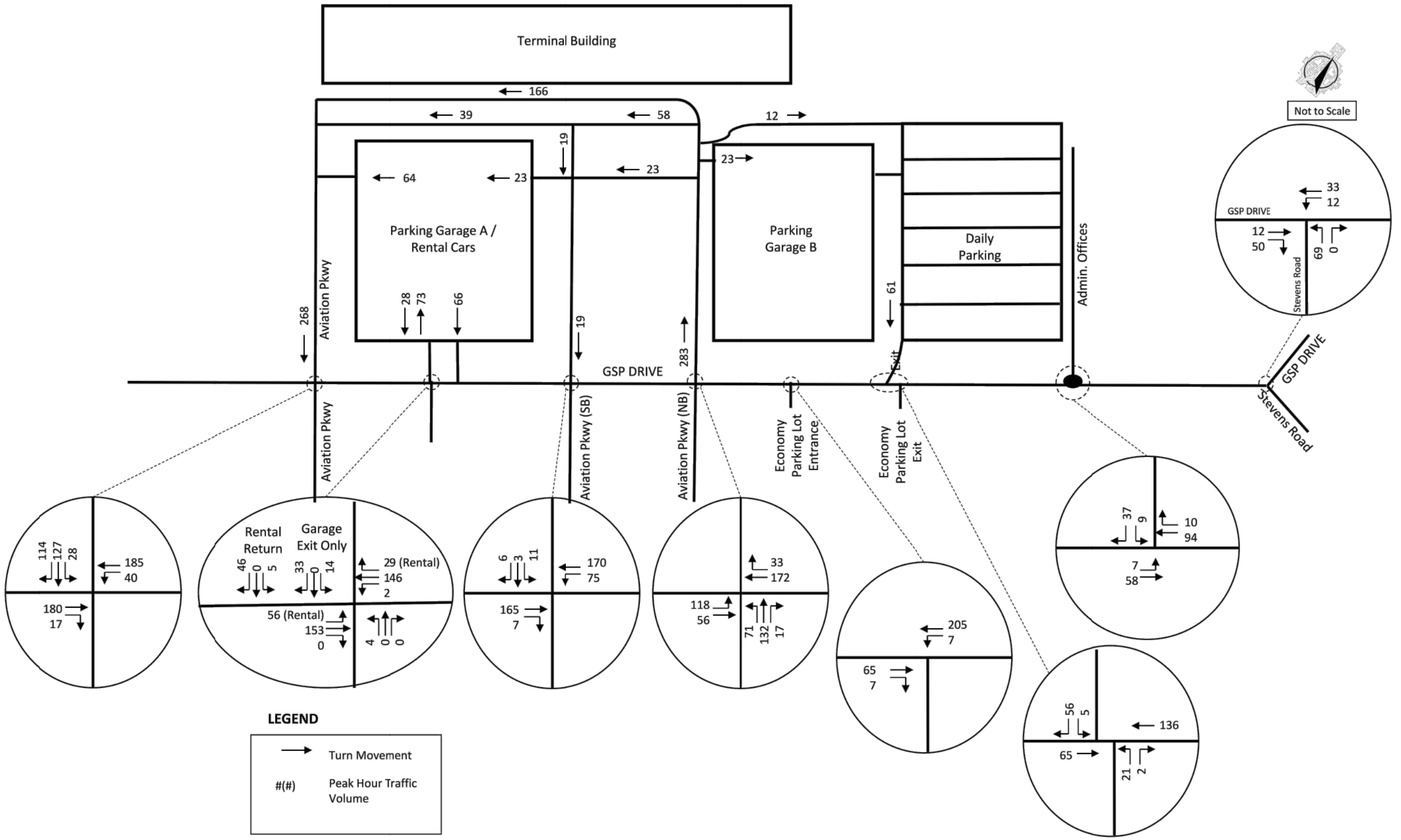
Figure 5-11: 90th Percentile Weekday AM Peak Volumes 8:45 to 9:45



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC.dwg

This page has been intentionally left blank.

Figure 5-12: 90th Percentile Weekday PM Peak Volumes 4:30 to 5:30



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC.dwg

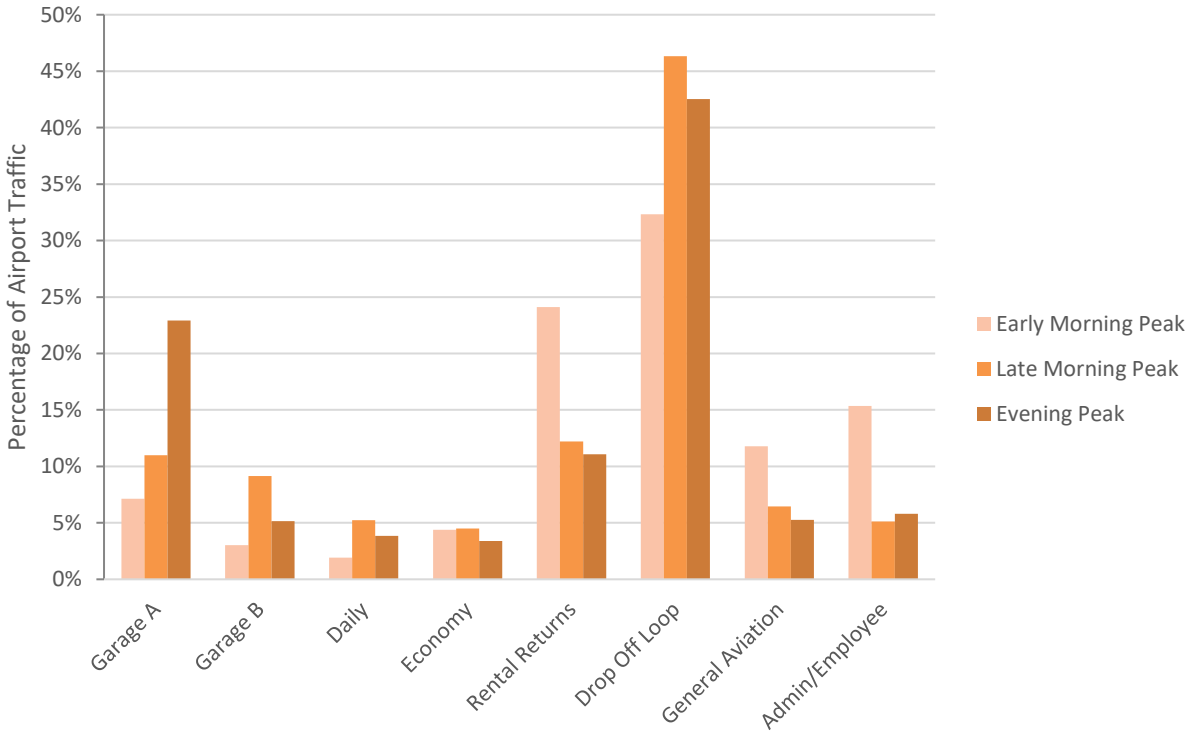
This page has been intentionally left blank.

Existing Traffic Patterns

The traffic data collected was used to determine the existing traffic patterns for the area and the distribution of traffic within the study area. It was identified that there is a significant amount of cut through traffic during the commuter peak hours (7:30-8:30AM and 4:30-5:30PM) that range from 20 to 50 percent of the traffic on GSP Drive. The cut through traffic generally represents vehicles that are neither originating from, or destined to, the airport or facilities on the airport. Rather this traffic is effectively using GSP Drive as a shortcut alternative route to Interstate 85 and increasing congestion and road maintenance requirements at the Airport.

Figure 5-13 shows the distribution of airport-related traffic for each of the observed peak hours.

Figure 5-13: Airport-Related Traffic by Destination



Source: McFarland-Johnson Analysis, 2017.

As shown in Figure 5-12, the existing primary traffic destination is the terminal drop off area for all peak timeframes. Garage A has the most parking activity as the rental returns are also currently located within Garage A. This distribution was used to project future traffic volumes with adjustments to available destinations that includes Garage C and additional future surface parking lots.

Existing Traffic Operations

The existing roadway operations were analyzed utilizing Synchro and SimTraffic traffic modeling software. This software requires the input of the roadway conditions (number of lanes, lane widths, traffic controls, speed limits, etc.) as well as the existing traffic data (turn movement volumes, vehicle classification, etc.) to develop a model that simulates the traffic operations and

provides level of service (LOS) results. LOS is a term used to characterize the operational conditions of a traffic facility at a particular point in time. Numerous factors contribute to a facility's LOS including travel delay and speed, congestion, driver discomfort, convenience, and safety based on a comparison of the facility's capacity to the facility's demand. Alphabetic designations A through F define the six levels of service. LOS A represents very good traffic operating conditions with minimal delays while LOS F depicts poor traffic operating conditions with excessive delays and queues. Based on the operational conditions, primarily the amount of vehicle delays and queues, operating levels of service are calculated using the procedures defined in the 2010 Highway Capacity Manual, published by the Transportation Research Board. Table 5-17 provides the LOS results from the analysis of the existing traffic conditions which shows that the existing roadway network has adequate capacity for the current traffic demand of the airport. Synchro existing conditions traffic model result printouts are provided in Appendix B.

Table 5-17: Roadway Existing Conditions Level of Service Table

Study Intersection	Approach and Movement		7:30 AM - 8:30 AM LOS	8:45 AM - 9:45 AM LOS	4:30 PM - 5:30 PM LOS
GSP Drive at Aviation Parkway (SB)/West Loop (Un-Signalized)	Eastbound	T-L	A	A	B
	Westbound	T-R	A	A	B
	Southbound	L	A	A	A
		T-R	A	A	B
	Overall		**A**	**A**	**B**
GSP Drive at Parking Garage A/Rental Car Exit (Un-Signalized)	Eastbound	L	A	A	A
	Southbound	L	B	A	B
		R	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Aviation Parkway(SB)/Center Loop (Un-Signalized)	Eastbound	T-R	A	A	A
	Westbound	T	A	A	A
		L	A	A	A
	Southbound	T-R	A	A	A
		L	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Aviation Parkway(NB)/East Loop Entrance (Un-Signalized)	Northbound	L	A	B	B
		T-R	A	B	A
	Eastbound	L	A	B	B
	Westbound	T	A	A	A
		R	A	A	A
	Overall		**A**	**B**	**A**
GSP Drive at Economy Lot Entrance (Un-Signalized)	Westbound	T	A	A	A
	Overall		**A**	**A**	**A**
	Southbound	L	A	A	A

Study Intersection	Approach and Movement		7:30 AM - 8:30 AM LOS	8:45 AM - 9:45 AM LOS	4:30 PM - 5:30 PM LOS
GSP Drive at Daily Parking Exit (Un-Signalized)	**Overall**		**A**	**A**	**A**
GSP Drive at Economy Lot Exit (Un-Signalized)	Northbound	L	B	A	A
		R	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Admin. Offices (Roundabout)	Northbound	L	A	A	A
	Eastbound	L	A	A	A
	Westbound	T	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Stevens Road (Un-Signalized)	Northbound	L	A	A	A
	Westbound	L	A	A	A
	Overall		**A**	**A**	**A**

Source: McFarland-Johnson Analysis, 2017.

Future Traffic Volumes

The future traffic volumes analyzed for the study area were based on the Airport's annual enplanement forecast. The future traffic volumes were established based on a linear rate of growth from the current roughly 1.1 million annual enplanements in 2017, from which the existing traffic counts were taken, to a projected 3.5 million annual enplanements in the future. The projected future peak hour traffic volume flow diagrams are included as Figure 5-14 to Figure 5-16.

Future Traffic Operations

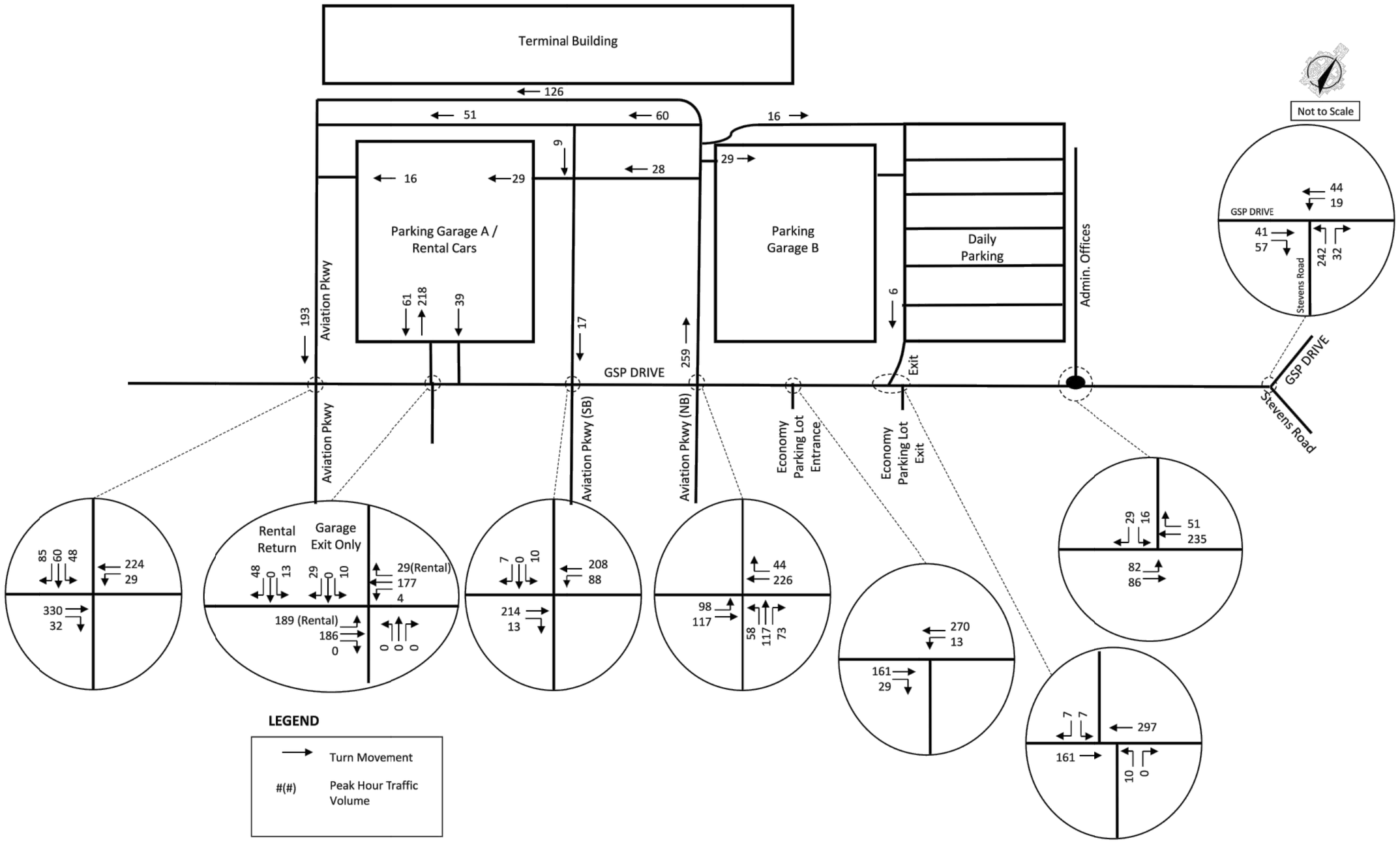
Future traffic volumes were determined with the non-airport cut through traffic removed, without considering roadway improvements, using Synchro and SimTraffic traffic modeling software packages and incorporating projected future traffic volumes. The existing traffic patterns were adjusted for future parking facilities and conditions. The results are shown in the Table 5-18.

Table 5-18: Roadway Future Conditions Level Of Service

Study Intersection	Approach and Movement		7:30 AM - 8:30 AM LOS	8:45 AM - 9:45 AM LOS	4:30 PM - 5:30 PM LOS
GSP Drive at Aviation Parkway (SB)/West Loop (Un-Signalized)	Eastbound	T-L	B	F	F
	Westbound	T-R	B	C	F
	Southbound	L	B	B	C
		T-R	A	C	F
	Overall		**B**	**E**	**F**
GSP Drive at Parking Garage A/Rental Car Exit (Un-Signalized)	Eastbound	L	A	A	A
	Southbound	L	C	D	E
		R	A	B	B
	Overall		**A**	**A**	**A**
GSP Drive at Aviation Parkway(SB)/Center Loop (Un-Signalized)	Eastbound	T-R	B	D	C
	Westbound	T	A	A	B
		L	A	B	C
	Southbound	T-R	A	B	B
		L	A	A	A
	Overall		**A**	**C**	**C**
GSP Drive at Aviation Parkway(NB)/East Loop Entrance (Un-Signalized)	Northbound	L	B	F	E
		T-R	A	F	C
	Eastbound	L	B	F	F
	Westbound	T	B	B	C
		R	A	B	C
	Overall		**B**	**F**	**E**
GSP Drive at Economy Lot Entrance (Un-Signalized)	Westbound	T	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Daily Parking Exit (Un-Signalized)	Southbound	L	B	B	B
	Overall		**A**	**A**	**A**
GSP Drive at Economy Lot Exit (Un-Signalized)	Northbound	L	B	A	B
		R	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Admin. Offices (Roundabout)	Northbound	L	A	A	A
	Eastbound	L	A	A	A
	Westbound	T	A	A	A
	Overall		**A**	**A**	**A**
GSP Drive at Stevens Road (Un-Signalized)	Northbound	L	B	B	B
	Westbound	L	A	A	A
	Overall		**A**	**A**	**A**

Source: McFarland-Johnson Analysis, 2017.

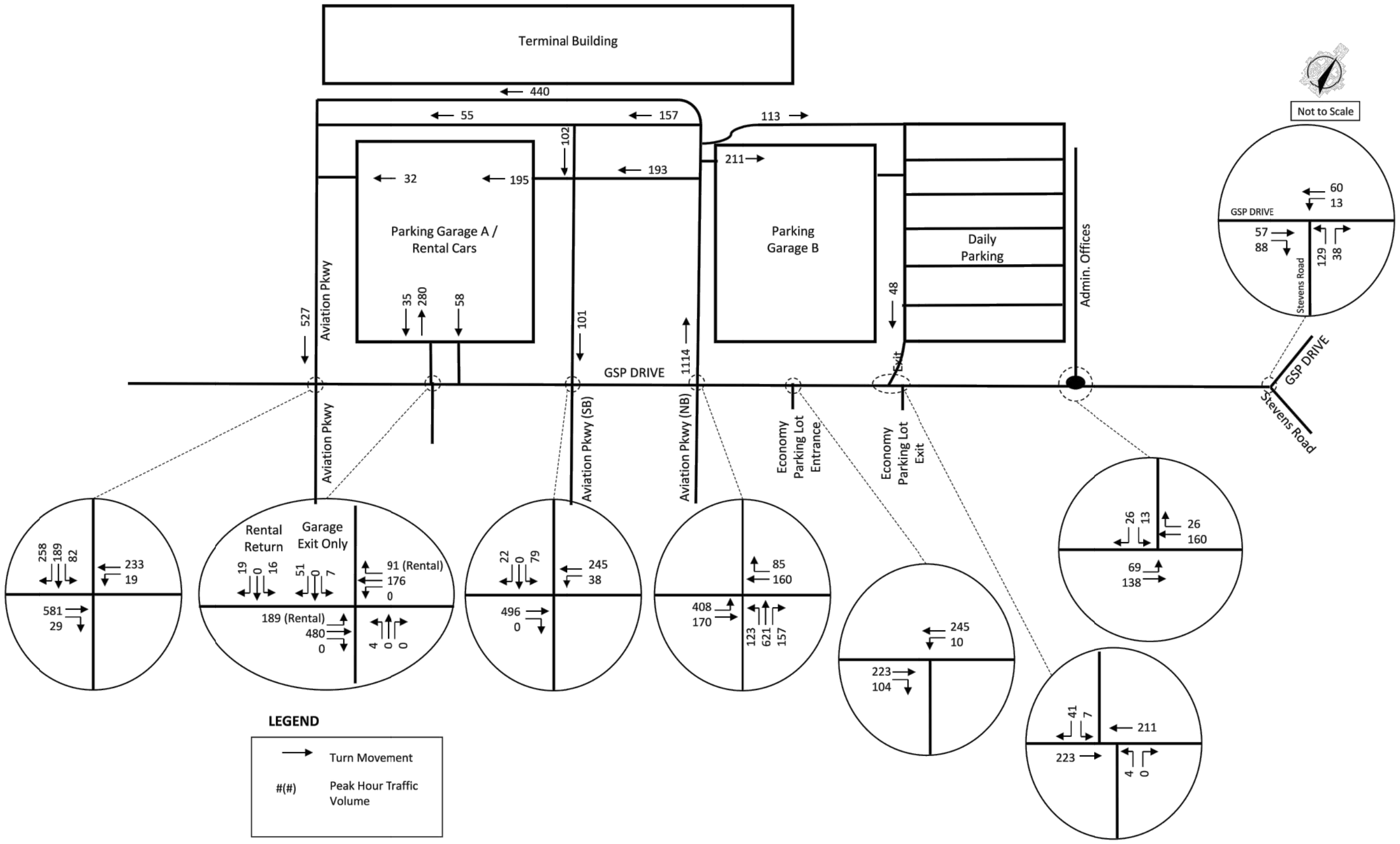
Figure 5-14: 3 Million Enplanements AM Peak Volumes 7:30 to 8:30



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC.dwg

This page has been intentionally left blank.

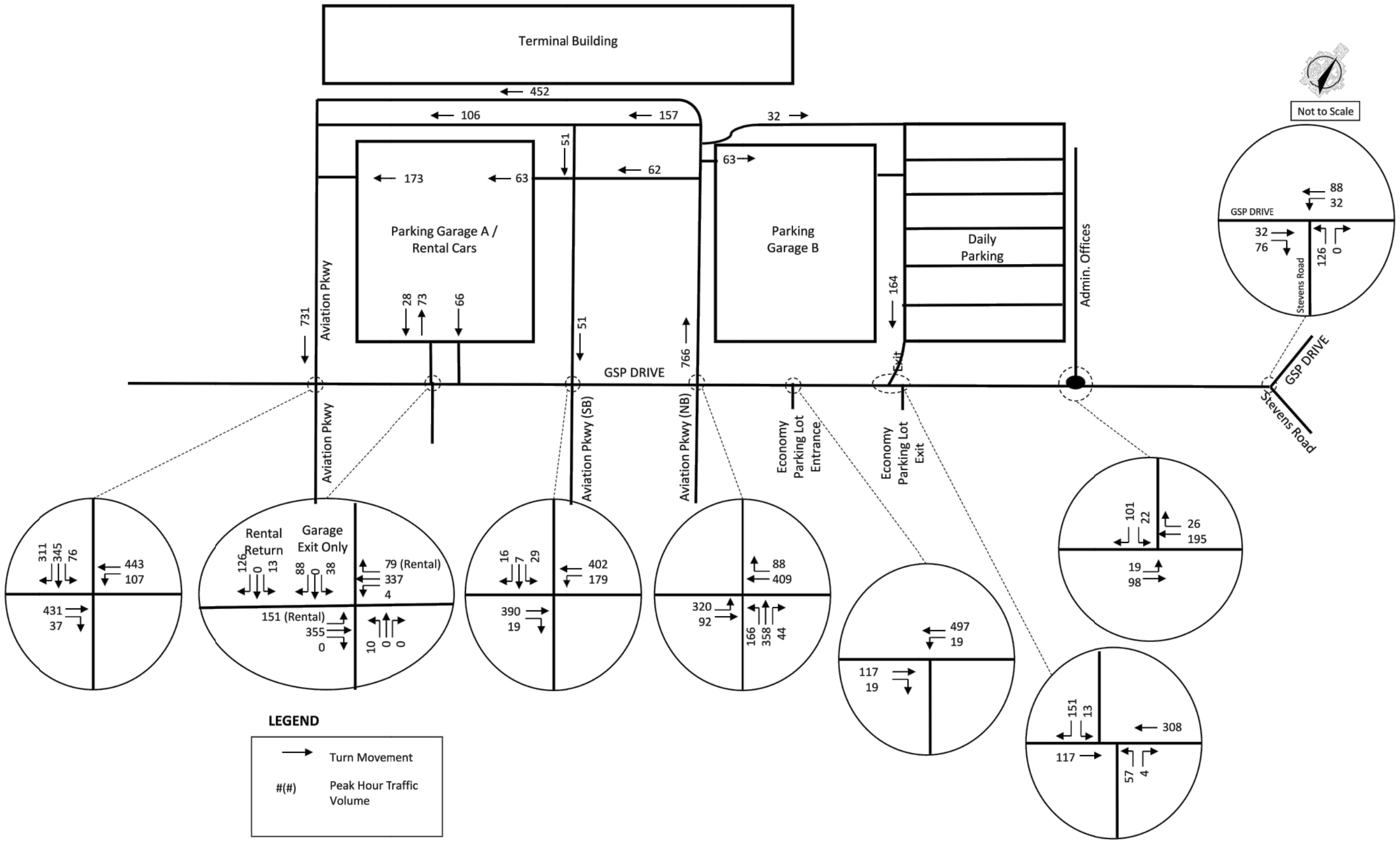
Figure 5-15: 3 Million Enplanements AM Peak Volumes 8:45 to 9:45



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC.dwg

This page has been intentionally left blank.

Figure 5-16: 3 Million Enplanements PM Peak Volumes 4:30 to 5:30



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\TRAFFIC.dwg

This page has been intentionally left blank.

The traffic model analysis results show that the existing roadway network does not have adequate capacity to accommodate the projected future traffic volumes. Significant degradation in LOS is anticipated with failing operations of an LOS E or F and congested operations of an LOS of D are projected during the airport and commuter peak hours throughout the day. Synchro future conditions traffic model result printouts are provided in **Appendix B**. Roadway improvements are assessed in Chapter 6 of this report to review various alternatives and their ability to mitigate the effects of the projected increase in traffic volume and improve accessibility to the airport. **Table 5-19** presents key findings relative to GSP's existing access roadway performance.

Table 5-19: Roadway Access Performance Key Findings

Facility	Performance Key Findings
Airport Entrance/Circulatory Roadway	
Traffic Levels, Congestion, and Level of Service	The existing roadway network does not have adequate capacity to accommodate the projected future traffic associated with airport growth to 3.5 million annual enplanements.
Operating Speeds	The existing operating speeds provide for efficient movement of vehicles within the study area. As the airport grows and additional parking lots are constructed, speeds should be further assessed if pedestrian crosswalks are maintained and/or proposed in new locations.
Geometric Issues	The existing roadways have adequate alignments for the design speeds; however, the un-signalized intersections do not have adequate capacity to accommodate the projected future traffic volumes. The terminal curb drop-off area is the primary vehicle destination within the airport. GSP Drive traffic is currently hindering this access and unrestricted/free flow access for the terminal loop is recommended as the airport traffic volumes grow.
Operational Efficiency	All entering traffic from both Aviation Parkway and GSP Drive are required to utilize Aviation Parkway when accessing the Terminal Drop Off, Rental Cars Drop off, Garage A, Garage B and the Daily Lot/Garage C. This combination of destinations to a single point is not sustainable as the airport continues to grow.
Access Control Issues	Stevens Road creates opportunity for cut through traffic and does not serve the commercial air traveler or GA user.
Other Facilities	
Pedestrian Accommodation	Pedestrian crosswalks are provided to the parking garages from the terminal and in a couple locations along GSP drive to access the economy lot. As the airport grows, pedestrian facilities to access new/expanded parking facilities should be incorporated.
Sign and Wayfinding	Existing patrons access the terminal, rental cars and parking garages through the Aviation Parkway leg into the Airport. As traffic volumes grow, segregation of these destinations as patron enter the airport with separate entrances and signage will be beneficial for customer wayfinding as well as traffic congestion.

Source: McFarland-Johnson Analysis, 2017.

5.4.2. On-Site Parking and Facility Assessment

Identified in Section 2.4.6 of this report, GSP maintains two parking garages, Garage A and B, and multiple surface lots organized for daily parking, economy parking, overflow parking, cell phone waiting, and employee parking. Rental car ready/return areas are currently located in Garage A but will be relocated to the new Garage C, once constructed. Existing parking lot capacities are summarized in **Table 5-20** below.

Table 5-20: Parking Facilities Overview

Parking Facility	Parking Spaces	Notes
Garage A	356 Covered Public Spaces 324 Uncovered Public Spaces 386 Covered Rental Spaces	All rental spaces to be converted to publicly accessible spaces once Garage C is operational.
Garage B	1,182 Covered Public Spaces 323 Uncovered Public Spaces	
Garage C	Currently in Design	Anticipated to be opened Summer of 2020
Daily Lot	367 Uncovered Public Spaces 117 Uncovered Valet Spaces	Spaces to be sacrificed for Garage C
Economy Lot	1,522 Uncovered Public Spaces	
Overflow Lot	500 Uncovered Public Spaces	Operational
Cell Phone Lot	40 Uncovered Public Spaces	
Employee Parking Lot	214 Employee Uncovered	Identified to be presently operating at capacity

Source: Greenville Spartanburg International Airport District, 2018.

The condition of Airport parking garages are in good condition and capable, if maintained, to support airport activity throughout the planning period. The condition of surface parking facilities in the terminal area is fair to good condition, with sections exhibiting longitudinal, transverse, and alligator cracking in the surface lots. Pavement drainage is good, with some localized ponding of water in parking lots most likely due to pavement overlays and crack sealing creating small low points. The overflow lot was recently constructed and is now opened to accommodate increase traffic from new air carrier entrant. This pavement is in excellent condition.

Parking Facilities Performance Key Findings

Parking demand was segregated into public parking and employee parking. The total existing demand for public parking is based on the estimated number of parked cars in a typical month based on data provided by the Airport parking operator quantifying movements into and out of Airport parking facilities, as well as on-site observation and discussion with Airport management staff. The demand for on-Airport public parking facilities was identified to be 80 percent or higher of available spaces in all GSP parking garages and lots. The practical capacity for a parking facility is generally assumed to be 85 percent to 90 percent of the available spaces because, at those occupancy levels, parking patrons have trouble in finding available spaces and chose to park at alternative locations or choose other access modes. As a result, on-airport parking facilities are recognized to be constrained currently and effectively operating at capacity during peak periods.

Table 5-21 summarizes the key findings made via field observations of Airport parking performance.

Table 5-21: Parking and Facilities Performance Key Findings

Facility	Performance Key Findings
Terminal Area Parking	
Parking Lot Utilization	Garage A – 85 percent utilized Garage B – 80 percent utilized Garage C – Zero percent utilized (under design) Daily Lot – 85 percent utilized Economy Lot – 80 percent utilized Overflow Lot – Utilization Varies Cell Phone Lot – Utilization Varies Employee Lot – 95 percent utilized
Peaking Characteristics	GSP Garages and surface parking lots have generally consistent demand across the year with peaks experienced in the summer months through the early fall. An analysis of activity levels by day of the week indicated that activity in the garages peak on Monday and Tuesday, while activity in the economy lot peaks on Friday and Saturday.
Other Facilities	
Location, Effectiveness, and Pedestrian Accommodation	Garages A and B are located near the terminal area. Garage A and B are connected to the terminal via covered concrete sidewalks equipped with striped crosswalks at each of two roadway crossings leading to terminal. Garage C is currently under design and anticipated to be connected to terminal via covered walkway upon completion through either a new connection or connection to the existing Garage B sidewalk. The Daily Lot will be removed to allow for Garage C. The Economy Lot is located east of GSP drive requiring an approximately 700-foot uncovered walk to the terminal from the lot's nearest corner. The Overflow Lot is located east of GSP drive and south of Aviation Parkway and not in near proximity to the terminal. This lot requires a transit connection to the terminal.
Sign and Wayfinding	Parking facilities are identified though conspicuous, concise, comprehensible, legible and well-located signage along aviation parkway and GSP drive. Parking garages are also equipped with a parking guidance to indicate available spaces to drivers.
Security Issues	Vehicles allowed to dwell at terminal curb for an extended period of time, parking in some cases.

Source: McFarland-Johnson Analysis, 2017.

Forecast of Peak Period Passenger Parking Demand

Forecast of peak period passenger parking demand is based on projections on peak month enplanement projections identified in Chapter 3, *Aviation Forecasts*, and average month parking garage/lot records. **Table 5-22** presents passenger demand factors utilized in the analysis while **Table 5-23** applies those factors to computationally explore future parking spaces anticipated per garage/lot. The total future number of parking spaces calculated was adjusted to compensate for the loss of 484 Daily Lot spaces with the construction of Garage C in 2019/2020. Additionally, a 25 percent utility/planning factor was applied to ensure a high level of service in all parking facilities throughout the planning period.

Table 5-22: Passenger Demand Factors

Factor	Demand	
Passenger Parking Facility	Vehicles Parked	
Average Month – Garage A		11,979
Average Month – Garage A Sky Lot		1,827
Average Month – Garage B+ Daily Lot		16,823
Average Month – Garage B Sky Lot		1,211
Average Month – Economy		9,020
Average Month – TOTAL		40,860
Enplanements	2017	2036
Average Month	84,551	137,338
Peak Month	95,373	154,917
Average Day/Peak Month	3,077	4,997

Source: ABM Parking Services, 2018; and McFarland-Johnson Analysis, 2017

Table 5-23: Peak Passenger Parking Demand

Garage	2017 Spaces	2017 Avg. Monthly Parking	Parking per Space	2037 Avg. Monthly Parking Demand	2037 Spaces Required	Surplus / (Deficit)	+25 Percent Utility/ Planning Factor
Garage A	356	11,979	33.65	19,458	578	(222)	(278)
Garage A Sky	324	2,968	5.64	2,968	526	(202)	(253)
Garage B + Daily	1,666	27,326	10.10	27,326	2,706	(1,040)	(1,300)
Garage B Sky	323	1,967	3.75	1,967	525	(202)	(253)
Economy Lot	1,522	14,651	5.93	14,651	2,472	(950)	(1,188)
						TOTAL:	(3,270)
						+ Daily Lot Loss for Garage C:	(3,754)

Source: McFarland-Johnson Analysis, 2017

Plans for the development of Garage C should consider the need for approximately 1,500 to 1,800 premium parking spaces in the future. The proposed relocation of rental car ready/return facilities from Garage A to the new Garage C will go a long way to better balancing publicly accessible garage parking facilities across the GSP terminal area. Future roadway developments around Garage C should consider segregated access points for private and rental cars.

Parking Demand Considerations

A number of factors that affect parking demand at airports should be monitored as scheduled passenger service offerings change at GSP and passenger behavior evolves around emerging technologies. These factors include:

- Originating Passengers: The ratio of originating to terminating passengers is a key metric for auto parking because only originating passengers have the ability to park at the airport. The inverse of this ratio, which represents terminating passengers is helpful in planning for rental car facilities and ground transportation. For this analysis, it is assumed that all passengers enplaned at GSP are originating passengers, since the Airport does not function as a hub for connecting flights. If service changes and the volume of originating passengers at GSP increases significantly, parking demand could increase.

- Impacts of ULCC Service: The average number of passengers per vehicle could increase if service by a ULCC is added at GSP, as leisure markets typically experience higher travel party size compared to business markets. ULCC service will also likely increase the duration of parked vehicles at GSP, and ULCC flights that operate once per day could limit space turnover since passengers departing on the one daily flight will arrive to the airport before arriving passengers on the inbound flight can vacate parking spaces. In the event that significant increases to weekly available seats to leisure markets are added at GSP, parking duration should be closely monitored to ensure that peak demand can be accommodated.

- Impacts to passenger's mobility options and transportation preferences over the next twenty plus years could have a significant impact in future demand for parking facilities at the Airport and how they are used. The rise of transportation network companies, development of autonomous vehicle technology, and even shifting values relative to vehicle ownership and non-traditional transit options are all likely to play a role in shaping GSP parking demand in the future. While Garage C will provide a significant boost in parking capacity, the same demand ratios may not be applicable as Airport enplanement volumes grow, past this study's planning period, towards 3 million annually.

Recommendations: Over the planning period an additional 3,754 parking spaces can be reasonably anticipated based on current use patterns. This includes approximately 2,000 in a garage with the remainder located in surface lots. Future land for beyond planning period needs should be reserved and traveler parking habits monitored over time.

Employee Parking Facility Requirements

The employee parking lot at GSP regularly operates at full capacity and additional employee parking is needed. The existing 214 employee lot is undersized and will be eliminated with the

construction of Garage C. Approximately 250 employee spaces are required today, and space should be planned to provide 400-500 spaces by the end of the planning period.

Recommendations: A relocated and expanded employee parking lot should be constructed to provide for 400-500 individual parking spaces. Should the future lot not be co-located with the terminal building, shuttle bus stops should be provided within the lot and the impact of employee shuttles on the terminal curb should be considered if necessary.

Parking Lot Connectivity – Bussing and PRT

As the GSP parking facility system is developed over time to support growing demand from commercial air travelers and other users, consideration should be given to the need for an internal shuttle bus or personal rapid transit (PRT) system to provide connectivity from all parking areas to the terminal in an integrated, safe, and sustainable way. The model for implementing bussing operations to shuttle travelers between parking facilities and the terminal curb is well understood and should be employed at GSP as parking lots not-contiguous with the terminal core or terminal campus begin being utilized. Over time, as driverless technologies become more developed and implementable, consideration should be given to PRT systems to more efficiently and economically provide for passenger/terminal connectivity.

5.4.3. Summary of Roadway Access and Parking Facility Requirements

The preceding sections reviewed the ability of existing airport roadway and parking facilities to support projected levels of activity across the planning period and beyond. **Table 5-24** summarizes future roadway and parking requirements.

Table 5-24: Parking and Roadway Access Facility Requirements Summary

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit/Goals
Airport Entrance/ Circulatory Roadway	Unable to provide current LOS through 3.5 MAEP	Phased approach to providing high LOS at 3.5 MAEP	Increase Capacity, Limit/Remove Full-Stop Intersections, Minimize Crosswalks, Decouple Terminal Curb and Parking Traffic, Balance Garage Utilization
Airport Parking	Most lots approaching capacity on peak days.	Support parking needs through 2 MAEP	Provide for an additional 2,000 garage spaces and 1,800 surface lot spaces.

Source: McFarland-Johnson Analysis, 2017

5.5. AIR CARGO FACILITY REQUIREMENTS

The following sections explore how growth in air cargo demand at GSP will drive development of dedicated air cargo facilities at the Airport. Section 3.5 of this report identifies strong growth in air cargo at GSP for both integrated carriers, such as FedEx and UPS, and all cargo carriers such as Senator International Freight Logistics, LLC (Senator). With compound annual growth rates forecasted between 3.2 percent and 6.1 percent, GSP can expect to facilitate the movement of anywhere from 103,000,000 pounds to 250,000,000 pounds by 2037, and upwards of 826,000,000 pounds by 2065 should trends continue. Existing cargo facilities and equipment, as discussed in Section 2.4.3 of this report, will be unable to support the variety and quantity of air cargo anticipated in the future. In fact, new cargo facilities are already under construction as of July 2018.

5.5.1. Near-Term Cargo Facility Developments

To better support the growing operations of Senator International a new 63,500 square yard cargo apron and 100,000 square foot air cargo building with 10,000 square feet of attached office space has been designed and is anticipated to be operational within year 1 of the planning period (2019). This new apron and building will allow Senator's current level of activity on the South Cargo Apron to relocate to the new north apron and provide additional space for the growing operation.

5.5.2. Methodology

Report 143 of the Transportations Research Board's (TRBs) Airport Cooperative Research Program (ACRP), entitled *Guidebook for Air Cargo Facility Planning and Development*, was published in 2015 and serves as the primary guidance to inform air cargo facility considerations at GSP. This report provides effective strategies and tools for identifying and responding to changing conditions affecting air cargo demand

The primary cargo-related facilities requiring analysis include:

- Cargo Building Space
- Aircraft Ramp Area
- Paved GSE Storage
- Truck and Auto Parking
- Landside/Airside Truck Doors

5.5.3. Assumptions

Air Cargo Building/Warehouse Space

Air cargo building facility requirements are based on the overall amount of cargo moving through the building and the throughput capacity of the portion of the building dedicated to air cargo processing/warehousing. Based on the survey data collected as part of ACRP Report 143, air cargo buildings for integrated express carriers at domestic airports average 29,100 square feet and at international gateway airports average 81,200 square feet. The report also indicates that when multiple integrated express carriers operate at an airport, one commonly has a larger sortation facility on airport, and another maintains a much smaller cargo building and trucks air cargo off

airport to a regional sortation facility. In these situations, the throughput ratio of the buildings are substantially different. This is the case with Fed Ex and UPS on the north cargo apron. Fed-ex operates from a 100,000 square foot cargo building/warehouse, while UPS operates from a much smaller 5,000 square foot building used solely to facilitate parcels moving from plane to truck. UPS maintains a very high throughput ratio with its building, while Fed-Ex is much lower on account of the building also being utilized as a sorting/warehousing facility.

Presently no dedicated cargo building/warehouse is available for all cargo freight carriers. The south apron is currently used to accommodate both airline belly cargo and all cargo freight operations. A new 100,000 square foot cargo building is under construction and will open to accommodate scheduled cargo services currently provided by Senator and relocated from the south apron.

Table 5-25 presents the default tonnage per square foot cargo building ratios used for this analysis. While these values are slightly below the ratios presented in ACRP Report 143, they are more in line with actual operations at GSP.

Table 5-25: Air Cargo Building/Warehouse Ratio Inputs

Integrated Express	All Cargo
0.20 Tons/SF	0.30 Tons/SF

Source: ACRP Report 143, McFarland-Johnson Analysis, 2017

Aircraft Apron Area

The role of the air cargo apron is to provide aircraft parking adjacent to the air cargo terminal building, provide sufficient space for ground handling operations for the loading and unloading of cargo aircraft as well as to service the aircraft, and provide sufficient space for the storage of ground service equipment, cargo containers, pallets, etc. Air cargo aprons are sized to accommodate the anticipated maximum amount of simultaneously parked aircraft and the size of those aircraft. Table 5-26 presents the air cargo parking requirement assumptions based on forecasted levels of air cargo and fleet mix.

Table 5-26: Air Cargo Apron Parking Requirements

Integrated Express	Existing	Short-Term	Mid-Term	Ultimate
Integrated Express PH Demand	D-IV (3)	D-IV (4) D-V (1)	D-IV (3) D-V (3)	D-IV (2) D-V (4)
All Cargo PH Demand	D-V (3)	D-IV (2) D-V (4) D-VI (0)	D-IV (0) D-V (6) D-VI (0)	D-IV (2) D-V (5) D-VI (1)

Source: McFarland-Johnson Analysis, 2017

Paved GSE Storage

Paved storage area for ground service equipment (GSE) is an essential component of the air cargo apron. This area is generally located in between the aircraft and the air cargo building or adjacent

to the aircraft and used to stage the wide variety of equipment utilized to efficiently load and unload aircraft.

Based on guidance from ACRP Report 143 and review of GSP operational practices, **Table 5-27** presents the tonnage per square foot GSE storage apron ratios used for this analysis.

Table 5-27: Air Cargo Building/Warehouse Ratio Inputs

Integrated Express	All Cargo
0.57 Tons/SF	1.11 Tons/SF

Source: ACRP Report 143, McFarland-Johnson Analysis, 2017

Truck Docks and Parking Areas

For the purpose of this analysis a ratio of one truck dock for every 2,400 square feet of cargo building will be utilized. Additionally, 75 percent of these docks will be assumed to be on the landside of the building while the remaining 25 percent are located on the airside. These assumptions are consistent with ACRP Report 143, typical air cargo developments, and the existing development on the north cargo apron at GSP.

To plan for appropriate space for truck and automobile parking the standard planning metric of 1.7 times the cargo building area was used. This metric is recommended for typical air cargo developments by ACRP Report 143 and is consistent with existing air cargo development at GSP.

5.5.4. Results of Analysis

Table 5-28 presents the results of the air cargo facility requirements based on the assumptions outlined in the preceding sections.

Table 5-28: Air Cargo Facility Requirements Summary

Item/Facility	Existing Facility or Capacity (2019)	Short-Term	Mid-Term	Ultimate
Aircraft Parking Positions	6	12	12	14
Air Cargo Building	100,000 SF	+110,581 SF	+156,614 SF	+262,487 SF
Aircraft Apron Area	30,000 SY	+ 16,911 SY	+ 20,800 SY	+ 39,267 SY
Paved Cargo Handling Ground Equipment Storage	9,500 SY	+ 1,529 SY	+ 3,330 SY	+ 8,624 SY
Total Apron	39,500 SY	+ 18,440 SY	+ 24,130 SY	+ 47,891 SY
Truck and Auto Parking	27,750 SY	None	+ 6,074 SY	+ 20,028 SY
Number of Landside Truck Docks/Doors	38 Doors	+ 17 Doors	+ 29 Doors	+56 Doors
Number of Airside Truck Doors	10 Doors	+ 9 Door	+ 13 Doors	+ 22 Doors

Source: McFarland-Johnson Analysis, 2017

Recommendations: Air cargo operations at GSP continue to grow rapidly and have expanded significantly during development of this Master Plan. Based on this growing and forecast demand, GSP should seek to meet the projected demand by developing additional air cargo facilities to meet the building, apron and parking requirements outlined above. Additional future cargo facilities beyond the current facility under construction (as of 2018) should be planned to meet forecast demand. Additional capacity beyond forecast numbers should also be considered should actual demand outpace forecast activity.

5.6. GENERAL AVIATION FACILITY REQUIREMENTS

This section discusses the requirements for each of the general aviation (GA) elements. Requirements for GA facilities at GSP were calculated based on data collected during the inventory, forecasts of aviation demand, consultation with Airport staff, as well as FAA standards. The following facilities were examined:

- Aircraft Hangars
- Aircraft Aprons
- General Aviation Terminal and FBO Facilities
- General Aviation Access and Auto Parking

5.6.1. Aircraft Hangars

General aviation hangars at an airport are planned for both based and itinerant aircraft. Requirements are calculated based on the size and quantity of aircraft based at the Airport. While each aircraft will vary in size, the following planning factors were used to calculate the approximate hangar space requirements for aircraft based at GSP:

- 1,200 square feet for single engine and rotor aircraft
- 1,600 square feet for multi engine aircraft
- 3,200 square feet for jet aircraft

The current hangar provisions for GA aircraft are shown in **Table 5-29**.

Table 5-29: Existing Hangar Facilities

Designation	Location	Lessee (Use)	Space in SF (Based Aircraft Storage in SF)
Hangar 1	2100 GSP Drive	PSA Airlines (Maintenance)	N/A
Hangar 2	2102 GSP Drive	Cerulean Aviation	29,700 (24,000)
Hangar 3	2106 GSP Drive	SAI Flight Service (Storage)	13,200 (All)
Hangar 4	2108 GSP Drive	Milliken (Storage/Office)	16,200 (13,200)
Hangar 5	2110 GSP Drive	Michelin (Storage/Office)	21,200 (17,800)
Hangar 6	2112 GSP Drive	Venture Air (Bulk Storage)	33,790 (All)

Source: Greenville-Spartanburg International Airport, 2017

Based Aircraft

As of 2017, 100 percent the based jet and multi-engine aircraft are housed within the conventional hangar space provided. It is anticipated that any additional jet and multi-engine aircraft will require additional conventional hangar space.

Ideally, 100 percent of aircraft are stored in hangars. For planning purposes, it is assumed that 75 percent of single-engine aircraft will be stored in conventional hangars and 25 percent will require apron space to tie-down. Additionally, 75 percent of multi-engine aircraft will be stored in conventional hangars and 25 percent will require apron parking space. All jet and rotor aircraft will be stored in conventional hangars.

Dependent on the aviation forecast outline in Chapter 3, *Forecast*, based aircraft hangar space demand was calculated as displayed in Table 5-30. This analysis shows based aircraft will not necessitate additional hangar capacity at GSP within the 20-year planning period. However, as GSP grows alongside its regional economy there is great potential for the Airport to benefit from unforeseen opportunities and outpace this study's conservative forecast for based GA aircraft. Further, opportunities to attract new based aircraft from regional sources has been identified by GSP. As such, it is prudent to plan for future facility expansion to accommodate such potential.

Itinerant Aircraft

As the owner and operator of the airfield's FBO, GSP currently offers a variety of high-level services to transient aircraft. As this operation grows, temporary aircraft storage for itinerant aircraft will elevate the FBO's capability to serve its client base. Aircraft storage demand for itinerant aircraft was calculated under the following assumptions:

- Peak day operations reflect the largest potential demand for itinerant aircraft
- Jet aircraft requiring hangar space account for 25 percent of itinerant GA operations
- Multi-engine aircraft requiring hangar space account for 25 percent of itinerant GA operations
- Single-engine itinerant aircraft do not require hangar space
- Only peak day arriving aircraft will require space (50 percent of total itinerant operations)
- Of peak day arriving aircraft, 75 percent will require hangar space at the same time.

Itinerant aircraft hangar space demand is displayed in Table 5-30, revealing only limited additional need within the current planning horizon, but substantial improvements beyond. It should be noted here that this model only explores requirements based on the forecast need which does not take into account the ability of the Airport to outperform its historical growth or market share by actively marketing new itinerant activity. As the regional economy grows, the Airport will only become more attractive to parties interested in locating their aeronautical assets and/or operations at the Airport.

Table 5-30: Aircraft Hangar Demand

Functional Area	Existing Facility	Short-Term	Mid-Term	Ultimate	Beyond 2040		
					2045	2055	2065
Based Aircraft Demand*	101,990 SF	None	None	None	None	+17,410 SF	+41,464 SF
Itinerant Aircraft Demand	0 SF	None	+12,000 SF	+12,000 SF	+14,400 SF	+28,800 SF	+28,800 SF
Total	101,990 SF	None	+12,000 SF	+12,000 SF	+14,400 SF	+39,010 SF	+79,864 SF

*Note: * = Subject to new based aircraft relocations.*

Source: McFarland Johnson Analysis, 2017

Recommendations: While based aircraft are forecast to drive limited demand for additional hangar capacity, the aeronautical forecasts do suggest that additional hangar capacity will be required to support growth in itinerant GA activities throughout the planning period. Additionally, it is important the Airport remain available to respond to current and unforeseen opportunities which could significantly impact GA facility needs. Planning for new facilities and additional long term GA development in the vicinity of the existing GA facilities is recommended.

5.6.2. Aircraft Aprons

The two general aviation apron areas are identified and discussed in Section 2.2.3 of this report and comprise an area of approximately 63,615 square yards of pavement. This area is utilized for a variety of purposes including:

- Based aircraft parking
- Itinerant aircraft parking (transient apron)
- Aircraft fueling apron/ fuel truck storage
- Staging and maneuvering areas

The sum of these components determines the total area of apron required to meet the forecasted level of general aviation activity at the Airport.

Based and itinerant Aircraft Parking

Parking demand for based aircraft was determined under the following assumptions:

- 25 percent of based single-engine aircraft require apron parking space
- 25 percent of based multi-engine aircraft require apron parking space
- Non-turbine-based aircraft require 300 square yards (SY) of parking space each.

Parking demand for itinerant aircraft was determined under the following assumptions:

- Calculate the total design day operations for all itinerant GA operations
- Calculate itinerant arrivals on the design day if half of the operations are arrivals.
- Assume that approximately 50 percent of these aircraft will require transient parking space during the course of the day. Of these, 25 percent are considered turbine aircraft with the remaining 25 percent a mix of single-and multi-engine propeller aircraft.

- Assume that up to 75 percent of these transient aircraft will be on the apron at the same time during peak events.
- Allow an area of 360 SY per transient propeller aircraft and 800 SY for turbine aircraft, due to the need for taxiing space and the consideration of aircraft of different sizes.

Existing apron area dedicated to the purpose of based and itinerant aircraft parking was calculated based on the following assumptions:

- The southern portion of the GA Apron is reserved for exclusive use and therefore not counted for based and itinerant aircraft tie-down needs
- Of the 53,000 square yards of pavement available on the North GA Apron:
  - 13,000 square yards is used as a taxilane
  - 30,000 square yards is reserved for hangar staging and maneuvering for apron fronting hangars
  - An additional 5,000 square yards is reserved for apron maneuverability
  - 1,500 square yards is reserved for parking of fuel trucks

Apron space requirements for based and itinerant GA aircraft parking at GSP are shown in **Table 5-31**.

Table 5-31: Apron Parking Demand

Functional Area	Existing Facility	Short-Term	Mid-Term	Ultimate	Beyond 2040		
					2045	2055	2065
Based Aircraft Demand*	1,200 SY	None	None	None	None	None	None
Itinerant Aircraft Demand	2,300 SY	+1,450 SY	+1,450 SY	+1,450 SY	+1,450 SY	+3,950 SY	+5,200 SY
Total	3,500 SY	+1,450 SY	+1,450 SY	+1,450 SY	+1,450 SY	+3,950 SY	+5,200 SY

Source: McFarland Johnson Analysis, 2017

Recommendations: As based and itinerant aircraft grow over the forecast period, increased apron space to accommodate aircraft parking is recommended. By the end of the planning period 1,450 additional square yards will be needed to meet this demand. Additionally, as the size of GA aircraft operating at GSP continues to increase, consideration should be given to the required load bearing capacity of existing GA aprons and the potential need to improve these pavements to meet the increased aircraft weights.

Staging and Maneuvering Areas

Adequate space for the safe maneuvering of aircraft to and from aprons, hangars, and taxiways must also be included in any forecast of apron requirements. Staging and maneuvering is most closely associated with the provision of space in front of conventional hangars. Space reserved for such use is generally equal to, or slightly higher than, the size of the adjacent hangar. Presently, adequate staging and maneuverability space is available on the GA aprons to support existing hangars. In the future, as additional hangars are built, a commensurate level of apron should be

provided. Based on Table 5-30, this would account for an additional 1,500 square yards of GA apron in the future.

Recommendations: Provide additional staging and maneuvering apron with the addition of any aircraft hangar for an area equal to or exceeding the size of the adjacent hangar.

5.6.3. General Aviation Terminal and FBO Facilities

A general aviation terminal provides space for offices, waiting area, flight planning, concessions, storage, and other amenities for pilots and passengers. General aviation terminals also provide the first and last impression of the airport and local area that GA pilots and passengers experience. As identified in Section 2.4.2 of this study, the existing FBO terminal facility is approximately 6,700 square feet in size. However, the existing space is not well organized, and the quality of overall user experience is of concern. The Airport recognizes the need to remodel and expand this space in the future.

The following analysis was conducted to estimate what amount of space should be considered to accommodate the pilots/passengers expected during the planning period. For this, an estimate of the peak hour pilots/passengers is necessary to determine the number of people that would use the general aviation terminal facilities during a one-hour period. To estimate the peak hour pilots/passengers and terminal spatial requirements, the following methodology was applied with the results shown in **Table 5-32**.

- The number of GA operations conducted during the peak hour of the average day during the peak month was calculated using data from the forecast chapter. It was assumed GA activity represents 25 percent of total airport activity. It was further assumed that arriving and departing general aviation pilots/passengers could use the terminal at the same time. Likewise, both local and itinerant operations would require terminal space at the Airport.
- The adjusted peak hour operations (arriving or departing) were estimated to have an average of five people on board (pilots and passengers).
- An area of 200 SF was used for each peak hour pilot/passenger to determine the terminal space requirements. This value accommodates all functions of a full-service general aviation terminal building including FBO counter space, waiting area, snack room, office space, pilot's lounge, restrooms, training area, circulation space, etc.

Table 5-32: GA Terminal Gross Area Analysis

	Existing Facility	Short-Term	Mid-Term	Ultimate	Beyond 2040		
					2045	2055	2065
GA Peak Hour Operations	4	4	4	5	6	6	7
Number of People	24	30	30	36	42	48	54
Total Terminal Space Required	4,800	6,000	6,000	7,200	8,400	9,600	10,800
Additional Need	None	None	None	500 SF	1,700 SF	2,900 SF	4,100 SF

Source: McFarland-Johnson Analysis, 2017

Recommendations: In the short-term the Airport should focus on a remodeling and rejuvenation effort for the GA Terminal building. In the mid- to long-term the Airport should plan to expand the facility up to 4,100 square feet. It may be necessary to complete such an expansion sooner in the planning period to meet unforeseen demand and/or elevate the customer experience.

5.6.4. General Aviation Access and Auto Parking

All general aviation facilities at the Airport are accessible via GSP drive north of the passenger terminal complex. To access the GA facilities, most customers utilize Aviation Parkway from I-85 or come in on GSP Drive from SC Route 14. Stevens Road provides an alternative means of access from SC Route 101 via State Rd. S 42-12, though is utilized less often. Ideally, access to GA facilities at the Airport would be provided by a dedicated route separated from commercial terminal traffic. Any future roadway improvements at GSP should consider an alternative and segregated route to the GA development area.

There are several corporate hangar areas on-Airport which individually provide vehicular parking for their users. With these being privately owned/operated facilities, the Airport does not provide any vehicle parking for the private use facilities. However, approximately 115 parking spaces are located adjacent to the FBO terminal building and available for use by the public. **Table 5-33** displays FBO vehicle parking requirements.

General aviation auto parking demand is identified based on the following assumptions:

- Peak hour operations can often compound over multiple days.
- Vehicles in the FBO parking lot can often remain for multiple days
- Five vehicle parking spaces per 1,000 square feet of FBO terminal is the lower bound parking demand ratio
- Ten vehicle parking spaces per 1,000 square feet of FBO terminal is the upper bound parking demand ratio

Table 5-33: GA FBO Auto Parking

	Existing Facility	Short-Term	Mid-Term	Ultimate	Beyond 2040		
					2045	2055	2065
Terminal Space Required	4,800	6,000	6,000	7,200	8,400	9,600	10,800
5 Spaces per 1,000 SF	24	30	30	40	45	50	55
10 Spaces per 1,000 SF	48	60	60	80	90	100	110
Additional Need	None	None	None	None	None	None	None

Source: McFarland-Johnson Analysis, 2017

Recommendations: Limited improvements to the GA parking lot should be considered with any future expansion of the FBO and GA terminal building.

5.6.5. General Aviation Facility Requirements Summary

The preceding sections reviewed a variety of general aviation facilities at GSP, **Table 5-34** summarizes their future requirements.

Table 5-34: General Aviation Facility Requirements Summary

	Existing Facility	Short-Term	Mid-Term	Ultimate	Beyond 2040		
					2045	2055	2065
Total Hangar Need	101,990 SF	None	None	+12,000 SF	+14,400 SF	+39,010 SF	+70,264 SF
Total Apron Need	2,867 SY	None	None	+733 SY	+1,213 SY	+2,653 SY	+4,093 SY
Total Terminal Need	None	None	None	500 SF	1,700 SF	2,900 SF	4,100 SF
FBO Auto Parking Need	None	None	None	None	None	None	None

Source: McFarland-Johnson Analysis, 2017

5.7. AIRPORT SUPPORT FACILITY REQUIREMENTS

5.7.1. Air Traffic Control Tower (ATCT)

The existing air traffic control tower (ATCT) is discussed in detail in Section 2.3.1 of this report. GSP's ATCT is currently located on the north end of the terminal building on the commercial terminal apron. In this location, the ATCT would limit the ability to expand concourse B and a new site near the GA area is currently being studied by the FAA. This future site is anticipated to be the location for a replacement tower to be built by the FAA sometime in the future. This site is being studied to ensure the future tower has unrestricted visibility of all aircraft movement areas on the future airfield as identified in this report.

Recommendation: No upgrades are required for the ATCT. However, future development should consider its impact to ATCT line-of-sight of airfield movement areas and glare.

5.7.2. Aircraft Rescue and Fire Fighting (ARFF)

As discussed in Section 2.4.4 of this report, the existing GSP ARFF facility is located on the north end of the passenger service apron next to the ATCT where it has immediate access to Runway 4-22 and ARFF personnel are able to quickly respond to any passenger emergencies in the terminal building. This Index C ARFF Facility is currently equipped with three ARFF trucks, one quick response ARFF truck, one custom pumper, one heavy rescue service truck, and one brush truck.

ARFF index requirements are defined by two factors: 1) the length of air carrier aircraft, and 2) the average daily departures of air carrier aircraft. Air carrier aircraft are grouped by length to determine an airport's ARFF index as detailed below:

- Index A includes aircraft less than 90 feet in length
- Index B includes aircraft at least 90 feet but less than 126 feet in length
- Index C includes aircraft at least 126 feet but less than 159 feet in length
- Index D includes aircraft at least 159 feet but less than 200 feet in length
- Index E includes aircraft at least 200 feet in length

Based on the current and future anticipated fleet mix for air carrier aircraft at GSP, the existing level of equipment meeting Index C requirements is sufficient throughout the planning period.

Furthermore, the existing ARFF building is sufficient to house all ARFF equipment and provides ample support/operational space for ARFF personnel. The location of the existing ARFF facility, which also houses the airfield electrical vault, limits the future development of Concourse B and, being an aging facility, is slated for demolition and replacement in the future. Design has already been procured for a replacement ARFF facility just south of the GA apron area.

Recommendation: No facility improvements or additional ARFF equipment is required over the planning period.

5.7.3. Airfield Maintenance Facility and Equipment

The Airport operations staff performs the day-to-day responsibilities of maintaining and inspecting the airfield facilities, including the removal of snow, as needed, during winter months.

As noted in Section 2.4.4 of this report, the Airport has wide variety of vehicles and equipment for airfield and grounds maintenance and snow removal stored in one of four maintenance facility buildings developed on an approximately 9-acre area of the airfield located off the south edge of the commercial terminal apron and south cargo apron.

In recent years the Airport developed its maintenance area significantly through the construction of two new maintenance buildings, expansion of the maintenance employee parking lot, and development of fuel and liquid chemical storage facilities.

Based on discussion with Airport maintenance staff the following notes were made relative to future facility and equipment planning:

- The Airport maintenance facilities operate at capacity today.
- The Airport plans to acquire an additional snow machine in the short-term.
- Future buildout of terminal concourse and anticipated growth in cargo facilities are likely to require additional maintenance facilities in equipment beyond what is presently available at GSP, to include:
    - An additional two to three service bays on existing maintenance building
    - Additional diesel and gasoline storage
    - A doubling of capacity to store de-ice material/liquid
- A new building or addition to existing maintenance building for fuel truck service to support current operations and future growth. Currently fuel trucks are serviced on the apron outside of the maintenance building.
- An additional storage building is required in the short-term to house miscellaneous maintenance equipment for currently not stored under cover.

Recommendation: It is recommended that the Airport plan for growth in both maintenance facilities and equipment within the confines of the existing airfield maintenance area. Space should be provided for expansion of the existing maintenance building to provide two to three additional equipment bays, a new equipment storage building, and an expanded fuel and chemical storage area.

5.7.4. Aviation Fuel Storage and Distribution

The Airport's existing fuel facilities are discussed in Section 2.4.4 which identifies five aviation fuel tanks having a total Jet-A capacity of 150,000-gallons and 12,000-gallon capacity for avgas. Fuel flowage information for calendar year 2017 was provided by the Airport-owned FBO, Cerulean Aviation, the sole purveyor of fuel at the airfield, and was used to project fuel demand over the planning period. Although the Airport currently receives fuel deliveries nearly daily, it should not be dependent on such frequency. Storage capacity capable of facilitating a 5-day or 7-day demand would increase the operational reliability to the Airport during times of fuel shortage or unforeseen logistical issues related to the delivery of fuel.

Based on fuel flowage projections it is estimated that over 16.5 million gallons of Jet-A and over 45,000 gallons of AvGas will be sold at GSP annually by 2037. These calculations are developed by calculating the 2017 gallons per operation value and applying it to forecast annual activity levels. The results of this analysis are depicted in **Table 5-35** and **Table 5-36.**

Table 5-35: Airport Fuel Sale Projection – Jet-A

Year	Annual Operations	Gallons/ Operation	Annual Fuel Demand	Peak Day Operations	Storage Requirement (Gal.)	
					5-Day	7-Day
2017	44,632	297.43	13,274,742	137	203,737	285,232
2022	46,562	297.43	13,848,775	143	212,660	297,724
2027	49,497	297.43	14,721,722	152	226,044	316,462
2037	55,885	297.43	16,621,683	171	254,300	356,020

Source: McFarland Johnson, 2017.

Table 5-36: Airport Fuel Sale Projection – AvGas

Year	Annual Operations	Gallons/ Operation	Annual Fuel Demand	Peak Day Operations	Storage Requirement (Gal.)	
					5-Day	7-Day
2017	44,632	0.78	34,904	137	536	750
2022	46,562	0.78	36,413	143	559	783
2027	49,497	0.78	38,709	152	594	832
2037	55,885	0.78	43,704	171	669	936

Source: McFarland Johnson, 2017.

Recommendation: Jet-A storage capacity should be doubled by 2022 to provide for a minimum five-day storage capacity throughout the planning period. Additionally, based on data received from Airport staff, fuel trucks currently often operate at capacity, and an additional fuel truck should be planned for in the short-term. As new Jet-A storage capacity comes on-line in the future, consideration should be given to a separate fuel farm to support air cargo operations.

5.7.5. Support Facility Requirements Summary

The preceding sections reviewed a variety of support facilities at GSP, **Table 5-37** summarizes their future requirements.

Table 5-37: Support Facility Requirements Summary

Item/Facility	Existing Facility or Capacity	Ultimate Requirement
Air Traffic Control Tower	Fully Visible Airport Operations Area	New ATCT development on new site
Aircraft Firefighting/Rescue	Meets Index C Requirements	New ARFF development on new site
Airfield Maintenance	Four Buildings 9.18 Acre Site	+2-3 Service Bays Expanded diesel/gas storage Expanded chemical storage New building for fuel truck maintenance New building for miscellaneous equipment
Fuel Storage and Distribution	150,000-Gallon Jet-A 12,000-Gallon AvGas	300,000-Gallon Jet-A 12,000-Gallon AvGas

Source: McFarland-Johnson Analysis, 2017

5.8. FORECAST SCENARIO FACILITY REQUIREMENTS

The following sections discuss the forecast scenarios identified for this study and their impacts on airport facilities, especially the passenger terminal complex as its facilities predominately impacted by shifts in peak hour activity and therefore more sensitive to shifts in demand patterns than other airfield facilities. It should be noted that these scenarios are not mutually exclusive and should multiple occur the prospective operational impacts would be additive.

5.8.1. New Ultra Low-Cost Carrier (ULCC) Service

Compared to network airlines or even low-cost carriers (LCCs), the ULCC model favors less than daily service and varying schedules. This scenario considers the introduction of a new ULCC providing an average of 10-weekly frequencies to multiple destinations on aircraft in the 150 to 175 seat range.

The introduction of a new ULCC could increase total enplanements by the end of the planning period by approximately 217,152 over the baseline forecast to a total of 1,865,204. While this would represent a 13 percent increase in annual enplanements, introduction of new ULCC activity is not likely to cause a 13 percent increase in peak hour. In focusing more on the leisure traveler, the ULCC model is less focused on early morning and late afternoon flights and is more likely to utilize airport spaces in off-peak times. As such, to forecast facility requirements along this scenario, a five percent increase to peak hour demand is anticipated.

5.8.2. New LCC Service

Unlike the various schedules of the ULCC model, the LCC model tends to favor large focus cities as opposed to point-to-point or hub-and-spoke models. This scenario considers the introduction of new LCC service to one or two large focus cities with an average of three daily departures on aircraft in the 100 to 120 seat range.

The introduction of a new LCC could increase total enplanements by the end of the planning period by approximately 115,684 over the baseline forecast to a total of 1,763,736, representing seven percent increase in annual enplanements. Unlike the ULCC scenario, it is plausible to assume that an LCC service would seek to compete for demand to the paired focus city and desire to operate in peak times. For this reason, a seven percent increase to peak hour activity is considered resulting in needs below those associated with the two million annual enplaned passenger scenario.

5.8.3. New International Service

Many medium sized airports such as Buffalo, Columbus, and Providence have seen the introduction of international service over the past several years and there is potentially opportunity for this trend to continue for small-hub airport such as GSP. This scenario will consider the demand and facility impacts associated with the introduction of twice weekly service to markets such as Cancun on aircraft in the 150-175 seat range.

The introduction of a new international service could increase total enplanements by the end of the planning period by approximately 22,464 over the baseline forecast to a total of 1,670,516. Despite this scenario being small in relation to annual activity, representing only a 1.4 percent increase over forecasted enplanements, the nature of international traffic could have significant impacts to terminal requirements. However, with the existence of 15 U.S. Customs and Board Protection (CBP) air preclearance stations around the world and the expansion of that program, these impacts can be hard to predict. Presently 15 airports in six countries: Dublin and Shannon in Ireland; Aruba; Freeport and Nassau in the Bahamas; Bermuda; Abu Dhabi, United Arab Emirates; and Calgary, Toronto, Edmonton, Halifax, Montreal, Ottawa, Vancouver, and Winnipeg in Canada, are equipped with CBP preclearance operations. Stockholm, Sweden and Punta Cana, Dominican Republic are also anticipated to be equipped soon, and the program continues to grow.

Should CBP facilities be required at GSP to process new international service under this scenario which is not precleared out of country, a Federal Inspection Station (FIS) would need to be constructed within the terminal building and a sterile corridor provided connecting deplaning international passengers with the station.

5.8.4. Market Interruption

While long term growth is anticipated for GSP, there is a potential for a temporary market interruption due to factors unrelated to the local GSP passenger market. Examples of a market interruption include airline network changes (loss of service or bankruptcy), enhanced low-fare competition at Charlotte Douglas International Airport (CLT), or a 9/11-like national event.

This scenario includes a ten percent drop in passenger demand/traffic with a 5-year recovery period (two percent annually). Such an operational interruption will not significantly impact growth management at the Airport but will likely require the reassessment of project phasing and capital improvement prioritization.

5.8.5. Enhanced Aircraft Up-gauging

Enhanced up-gauging of aircraft could result in systemic terminal impacts as peak hour activity is likely to grow by 12 to 15 percent as this scenario includes a high mix of mainline aircraft (seating minimum of 150 passengers) expected to replace some frequency of multiple regional aircraft. This would place peak period demands on spaces from curb to gate, beyond what they may be currently designed for.

5.9. FACILITY REQUIREMENT SUMMARY

The facility requirements recommended for GSP are expressed in the preceding sections and **Table 5-38**. highlights the key improvements that are recommended for future development at GSP.

Table 5-38: Facility Requirements Total Summary

Airfield Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
Pavement Management	Unable to provide structurally sound pavement for forecasted aircraft mix throughout the 20-year horizon.	Provide structurally sound pavement fore forecasted aircraft mix throughout the 20-year horizon.	Taxiway L Rehabilitation Runway 4-22 Asphalt Rehabilitation Reconstruct Itinerant Apron Localized PCC Repairs and Joint Sealing
Runway Length	11,001 FT	11,001 FT	None
Runway Width	150 FT	150 FT	None
Runway Orientation	Meets 95% wind coverage in all conditions	Meet 95% wind coverage in all conditions	None
Runway Designation	4-22	4-22	None
Runway Safety Areas	Runway 4-22 500 FT wide 1,000 FT past RW ends Limited ability to meet grade requirements	Runway 4-22 500 FT wide 1,000 FT past RW ends Full ability to meet grade requirements	Meet grade requirements
Runway Object Free Area	Runway 4-22 800 FT wide 1,000 FT past RW ends	Runway 4-22 800 FT wide 1,000 FT past RW ends	None

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
	Meets clearance requirements	Meets clearance requirements	
Runway Protection Zone	Runways 4 & 22 1,000 FT Inner Width 2,500 FT Length 1,750 FT Outer Width Airport ownership/ Right-of-way/ Easement	Runways 4 & 22 1,000 FT Inner Width 2,500 FT Length 1,750 FT Outer Width Airport Ownership/ Right-of-Way/ Easement	None
Runway Pavement Markings	Precision Instrument Markings	Precision Instrument Markings	None
Taxiways[1]	Full Length Parallel Ample Entry/Exits Meets TDG-5/6 Meet ADG VI standards Unable to fully provide TDG-5/6 Fillets Does not meet geometry	Full Length Parallel Ample Entry/Exits Meets TDG-5/6 Meet ADG VI standards Provide TDG-5/6 Fillets Meets geometry	Improve Intersection Fillets Correct Geometry
Approach Lighting	Runway 4 2,400 FT ALSF-2 Runway 22 2,400 FT MALSR	Runway 4 2,400 FT ALSF-2 Runway 22 2,400 FT ALSF-2	Runway 22 2,400 FT ALSF-2
Airfield Lighting	Runway 4-22 – HIRLs	Runway 4-22 – HIRLs	None
Airfield Signage	Meets Standards	Meet Standards	None
Runway Visual Aids	Runway 4 – PAPI Runway 22 – PAPI	Runway 4 – PAPI Runway 22 – PAPI	None
Instrument Approaches	Runway 4 – ILS/LOC (CAT I, II, and III) Runway 4 –GPS - LPV Runway 22 – ILS/LOC (CAT I) Runway 22 –GPS - LPV	Runway 4 – ILS/LOC (CAT I, II, and III) Runway 4 –GPS - LPV Runway 22 – ILS/LOC (CAT II and III) Runway 22 –GPS - LPV	CAT II/III approach to Runway 22

Passenger Terminal Facility Requirements

Functional Area	Existing Facility	Ultimate Requirement	2 MAEP	Beyond 2040		
				2045	2055	2065
Annual Enplanements	1,182,700	1,648,052	2,000,000	2,153,123	2,745,443	3,500,708
Peak Hour Enplanements	622	1,010	1,226	1,320	1,683	2,145
Gates	13	+2 Gates	+5 Gates	+6 Gates	+10 Gates	+15 Gates
Curb Length	1,000 LF	+65 LF	+286 LF	+508 LF	+812 LF	+1,202 LF
Check-In/Ticketing						
Staffed Counter Positions	40 Positions	No Change	No Change	No Change	No Change	No Change
Check-In Ticket Area (Counter/Active/Queue)	4,998 SF	No Change	No Change	No Change	+674 SF	+2,175 SF
Kiosks Positions	19 Positions	No Change	No Change	No Change	+5 Positions	+11 Positions
Kiosk Check-In Area (Active/Queue)	2,691 SF	+206 SF	+827 SF	+1,173 SF	+2,211 SF	+3,492 SF
Airline Ticket Office Area	8,631 SF	No Change	No Change	No Change	No Change	No Change
Check-In/Ticketing Circulation Area	7,300 SF	No Change	No Change	No Change	No Change	+672 SF
Restrooms	2,654 SF	No Change	+105 SF	+313 SF	+1,137 SF	+2,129 SF
Outbound Baggage Screening and Make-Up						
Level 1 EDS Units	4	No Change	+ 1 Unit	+ 1 Unit	+3 Units	+4 Units
Level 2 OSR Stations	2	+1 Station	+2 Stations	+2 Stations	+3 Stations	+4 Stations
Level 3 ETD Stations	2	+1 Station	+1 Station	+1 Station	+2 Stations	+3 Stations
Level 1 EDS Screening Area	2,054 SF	No Change	+446 SF	+446 SF	+1,446 SF	+1,946 SF
Level 2 OSR Screening Area	100 SF	+20 SF	+60 SF	+60 SF	+100 SF	+140 SF
Level 3 ETD Screening Area	400 SF	No Change	No Change	No Change	No Change	+100 SF
Make-Up Area (Including Baggage Train Circulation & Mech. Support Spaces)	15,032 SF	No Change	No Change	No Change	+1,528 SF	+6,496 SF
Passenger Security Screening Checkpoint						
Screening Lanes	4 Lanes	+3 Lanes	+5 Lanes	+2 Lanes	+3 Lanes	+5 Lanes

Functional Area	Existing Facility	Ultimate Requirement	2 MAEP	Beyond 2040		
				2045	2055	2065
Annual Enplanements	1,182,700	1,648,052	2,000,000	2,153,123	2,745,443	3,500,708
Peak Hour Enplanements	622	1,010	1,226	1,320	1,683	2,145
Security Screening Module Area	3,850 SF	+3,150 SF	+5,150 SF	+2,150 SF	+3,150 SF	+5,150 SF
Passenger Queue Area	3,026 SF	+3,519 SF	+4,918 SF	+5,528 SF	+7,880 SF	+10,874 SF
Allowance for Future Equipment Changes	1,524 SF	No Change	+170 SF	No Change	+267 SF	+766 SF
TSA Support Space Area	1,717 SF	+71 SF	+520 SF	+204 SF	+647 SF	+1,036 SF
Passenger Lounges/Holdrooms						
Holdrooms (Seated/Standing/Ticketing/Boarding)	36,950 SF 13 Gates	+ 1,180 SF +2 Gates	+ 8,806 SF +5 Gates	+11,348 SF +6 Gates	+21,516 SF +10 Gates	+34,226 SF +15 Gates
Allowance for Amenities	1,907 SF	No Change	+ 381 SF	+ 508 SF	+ 1,106 SF	+ 1,652 SF
Holdroom Circulation Area	12,600 SF	No Change	+ 1,813 SF	+ 2,614 SF	+ 5,817 SF	+ 9,820 SF
Restrooms	2,910 SF	+140 SF	+750 SF	+ 954 SF	+ 1,767 SF	+ 2,784 SF
Inbound Baggage Handling and Claim						
Baggage Claim Frontage (LF)	321 LF	+ 270 LF	+ 396 LF	+ 451 LF	+ 664 LF	+ 934 LF
Baggage Claim Units	3 Units	+ 2 Units	+ 4 Units	+ 4 Units	+ 6 Units	+ 8 Units
Baggage Claim Unit Area	2,967 SF	+ 2,345 SF	+ 3,481 SF	+ 3,976 SF	+ 5,885 SF	+ 8,315 SF
Passenger Queue & Bag Retrieval Area	8,048 SF	No Change	+ 62 SF	+ 684 SF	+ 3,085 SF	+ 6,141 SF
Baggage Service Office	588 SF	+ 611 SF	+ 868 SF	+ 979 SF	+ 1,411 SF	+ 1,959 SF
Allowance for Meeters/Greeters	2,665 SF	No Change	No Change	No Change	+ 333 SF	+ 1,156 SF
Baggage Claim Area Circulation	4,179 SF	No Change	+ 370 SF	+ 719 SF	+ 2,066 SF	+ 3,781 SF
Restrooms	1,391 SF	+1,420 SF	+ 2,021 SF	+ 2,283 SF	+ 3,293 SF	+ 4,579 SF
Take-Off Belts	3 Unites	+ 2 Units	+ 4 Units	+ 4 Units	+ 6 Units	+ 8 Units
Take-Off Belt Area	2,300 SF	+2,266 SF	+3,242 SF	+ 3,667 SF	+ 5,308 SF	+ 7,396 SF
Allowance for Baggage Train Circulation	5,160 SF	+1,688 SF	+3,153 SF	+ 3,791 SF	+ 6,252 SF	+ 9,385 SF

Functional Area	Existing Facility	Ultimate Requirement	2 MAEP	Beyond 2040		
				2045	2055	2065
Annual Enplanements	1,182,700	1,648,052	2,000,000	2,153,123	2,745,443	3,500,708
Peak Hour Enplanements	622	1,010	1,226	1,320	1,683	2,145
Allowance for Conveyor Belt & Equip.	500	+870 SF	+1,163 SF	+ 1,290 SF	+ 1,782 SF	+2,409 SF
Concourse Circulation/Concessions						
Pre-Secure Concession Area (Service/Support)	4,800	No Change	+240 SF	+ 626 SF	+ 2,119 SF	+ 4,022 SF
Post-Secure Concession Area (Service/Support)	19,200	No Change	+960 SF	+2,503 SF	+8,474 SF	+16,087 SF
Total Terminal Building Area Requirement	N/A	+ 17,756 SF	+ 38,414 SF	+ 46,267 SF	+ 89,918 SF	+149,622 SF

Source: McFarland-Johnson Analysis, 2017.

Roadway Access and Parking Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit/Goals
Airport Entrance/ Circulatory Roadway	Unable to provide current LOS through 3.5 MAEP	Phased approach to providing high LOS at 3.5 MAEP	Increase Capacity, Limit/Remove Full-Stop Intersections, Minimize Crosswalks, Decouple Terminal Curb and Parking Traffic, Balance Garage Utilization
Airport Parking	Most lots approaching capacity on peak days.	Support parking needs through 2 MAEP	Provide for an additional 2,000 garage spaces and 1,800 surface lot spaces.

Air Cargo Facility Requirements

Item/Facility	Existing Facility or Capacity (2019)	Short-Term	Mid-Term	Ultimate
Aircraft Parking Positions				
Air Cargo Building	100,000 SF	+110,581 SF	+156,614 SF	+262,487 SF
Aircraft Apron Area	30,000 SY	+ 16,911 SY	+ 20,800 SY	+ 39,267 SY
Paved Cargo Handling Ground Equipment Storage	9,500 SY	+ 1,529 SY	+ 3,330 SY	+ 8,624 SY
Total Apron	39,500 SY	+ 18,440 SY	+ 24,130 SY	+ 47,891 SY
Truck and Auto Parking	27,750 SY	None	+ 6,074 SY	+ 20,028 SY
Number of Landside Truck Docks/Doors	38 Doors	+ 17 Doors	+ 29 Doors	+56 Doors
Number of Airside Truck Doors	10 Doors	+ 9 Door	+ 13 Doors	+ 22 Doors

General Aviation Facility Requirements

	Existing Facility	Short-Term	Mid-Term	Ultimate	Beyond 2040		
					2045	2055	2065
Total Hangar Need	101,990 SF	None	None	+12,000 SF	+14,400 SF	+39,010 SF	+70,264 SF
Total Apron Need	2,867 SY	None	None	+733 SY	+1,213 SY	+2,653 SY	+4,093 SY
Total Terminal Need	None	None	None	500 SF	1,700 SF	2,900 SF	4,100 SF

FBO Auto Parking Need	None	None	None	None	None	None	None

Support Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement
Air Traffic Control Tower	Fully Visible Airport Operations Area	New ATCT development on new site
Aircraft Firefighting/Rescue	Meets Index C Requirements	New ARFF development on new site
Airfield Maintenance	Four Buildings 9.18 Acre Site	+2-3 Service Bays Expanded diesel/gas storage Expanded chemical storage New building for fuel truck maintenance New building for miscellaneous equipment
Fuel Storage and Distribution	150,000-Gallon Jet-A 12,000-Gallon AvGas	300,000-Gallon Jet-A 12,000-Gallon AvGas

Source: McFarland-Johnson Analysis, 2017

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019

AIRPORT MASTER PLAN UPDATE

CHAPTER 6: ALTERNATIVES

McFarland Johnson

Table of Contents

Chapter 6 - Alternatives

6. Alternatives 6-1
6.1. Identification of Development Alternatives 6-1
6.1.1. Airside Alternatives 6-2
6.1.2. Terminal Airside Alternatives 6-31
6.1.3. Landside Access and Parking Alternatives 6-50
6.1.4. Air Cargo Facility Alternatives 6-79
6.1.5. General Aviation Facility Alternatives 6-83
6.1.6. Other Aviation Development Properties 6-84
6.1.7. Support Facility Alternatives 6-89
6.2. Refinement and Evaluation of Development Alternatives 6-100
6.2.1. Evaluation Criteria 6-100
6.2.2. Refined Alternatives and Evaluation 6-101
6.2.3. Non-Aviation Land Use Considerations 6-155
6.3. Selected Airport Development Plan 6-163

List of Tables

Chapter 6 - Alternatives

Table 6-1 : Identified Airside Alternatives 6-5
Table 6-2 : Identified Terminal Airside Alternatives 6-33
Table 6-3 : Identified Landside Access Alternatives 6-51
Table 6-4 : Identified Air Cargo Facility Alternatives 6-83
Table 6-5 : General Aviation Facility Requirements 6-84
Table 6-6 : Identified General Aviation Facility Alternatives 6-84
Table 6-7 : Identified West Side Aviation Facility Alternatives 6-89
Table 6-8 : Identified South Side Aviation Facility Alternatives 6-89
Table 6-10 : Identified Support Facility Alternatives 6-100
Table 6-11 : Retained and Refined Airside Alternatives 6-102
Table 6-12 : Airfield Alternative Evaluation 6-109
Table 6-14 : Terminal Airside Alternative Evaluation 6-123
Table 6-16 : Landside Access Alternative Evaluation 6-128

List of Figures

Chapter 6 - Alternatives

Figure 6-1 : Alternative Identification and Refinement Flow Chart 6-2
Figure 6-2 : Parallel Runway Alternative 1 6-7
Figure 6-3 : Parallel Runway Alternative 2 6-9
Figure 6-4 : Parallel Runway Alternative 3 6-11
Figure 6-5 : Crossfield Taxiway Alternative 1 6-13
Figure 6-6 : Crossfield Taxiway Alternative 2 6-14
Figure 6-7 : Crossfield Taxiway Alternative 3 6-15
Figure 6-8 : Taxiway F Removal 6-17
Figure 6-9 : Taxiway E & F Removal 6-17
Figure 6-10 : Relocated Taxiway F South 6-17
Figure 6-11 : Taxiway E & F Replacement with 90° Connector Taxiway 6-17
Figure 6-12 : Relocated Taxiway F North 6-17
Figure 6-13 : Relocated Taxiway L2 South 6-19
Figure 6-14 : Relocated Taxiway L2 North 6-19
Figure 6-15 : Taxiway Filet Widening for TDG-6 on Taxiway A/B/J/K 6-21
Figure 6-16 : Apron Edge Taxilane Alternative 1 6-23
Figure 6-17 : Apron Edge Taxilane Alternative 2 6-23
Figure 6-18 : Apron Edge Taxilane Alternative 3 6-25
Figure 6-19 : Apron Edge Taxilane Alternative 4 6-25
Figure 6-20 : Runway 22 ALSF-2 6-27
Figure 6-21 : Taxiway H Alternative 6-29
Figure 6-22 : Taxiway L9 Realignment 6-30
Figure 6-23 : Terminal Alternative A1 - Ground 6-34
Figure 6-24 : Terminal Alternative A1 – International 6-35
Figure 6-25 : Terminal Alternative A2 6-36
Figure 6-26 : Terminal Alternative A3 – Ground 6-37
Figure 6-27 : Terminal Alternative A3 – International 6-38
Figure 6-28 : Terminal Alternative A4 – Ground 6-39
Figure 6-29 : Terminal Alternative A4 – International 6-40
Figure 6-30 : Terminal Alternative A5 – International 6-41
Figure 6-31 : Terminal Alternative A6 – Ground 6-42
Figure 6-32 : Terminal Alternative A6 – International 6-43
Figure 6-33 : Terminal Alternative B1 – Ground 6-44
Figure 6-34 : Terminal Alternative B1 – International 6-45
Figure 6-35 : Terminal Alternative B2 – Ground 6-46
Figure 6-36 : Terminal Alternative B2 – International 6-47
Figure 6-37 : Terminal Alternative B3 – Domestic 6-48
Figure 6-38 : Terminal Alternative B3 – International 6-49
Figure 6-39 : Landside Access Alternative 1A 6-53

Figure 6-40 : Landside Access Alternative 1B 6-55
Figure 6-41 : Landside Access Alternative 1C 6-57
Figure 6-42 : Landside Access Alternative 1D 6-59
Figure 6-43 : Landside Access Alternative 1E 6-61
Figure 6-44 : Landside Access Alternative 2A 6-63
Figure 6-45 : Landside Access Alternative 2B 6-65
Figure 6-46 : Landside Access Alternative 2C 6-67
Figure 6-47 : Landside Access Alternative 2D 6-69
Figure 6-48 : Landside Access Alternative 3A 6-71
Figure 6-49 : Landside Access Alternative 3B 6-73
Figure 6-50 : Landside Access Alternative 3C 6-75
Figure 6-51 : Landside Access Alternative 3D 6-77
Figure 6-52 : Airside Cargo Alternative 1 6-80
Figure 6-53 : Airside Cargo Alternative 2 6-81
Figure 6-54 : Airside Cargo Alternative 3 6-82
Figure 6-55 : GA Development Area Alternative 1 6-85
Figure 6-56 : GA Development Alternative Area 2 6-87
Figure 6-57 : West Side Aviation Development Area 1 6-91
Figure 6-58 : West Side Aviation Development Area 2 6-93
Figure 6-59 : South Side Aviation Development Area 1 6-95
Figure 6-60 : Fuel Farm Expansion Alternative 6-97
Figure 6-61 : Maintenance Yard Expansion 6-98
Figure 6-62 : Potential Ground Run Up Enclosure Site 6-99
Figure 6-63 : Refined Crossfield Taxiway Alternative 1 6-103
Figure 6-64 : Refined Crossfield Taxiway Alternative 2 6-104
Figure 6-65 : Refined Crossfield Taxiway Alternative 3 6-105
Figure 6-66 : Refined Apron Edge Taxilane Alternative 6-107
Figure 6-67 : Preferred Airfield Alternative 6-111
Figure 6-68 : Refined Terminal Alternative 1 6-115
Figure 6-69 : Refined Terminal Alternative 2 6-116
Figure 6-70 : Refined Terminal Alternative 3 6-117
Figure 6-71 : Refined Terminal Alternative 4 6-118
Figure 6-72 : Refined Terminal Alternative 5 6-119
Figure 6-73 : Refined Terminal Alternative 6 6-120
Figure 6-74 : Beyond Planning Period Terminal Alternative 1 6-121
Figure 6-75 : Beyond Planning Period Terminal Alternative 2 6-122
Figure 6-76 : Preferred Terminal Airside Development 6-125
Figure 6-77 : Refined Landside Access Alternative 1E 6-129
Figure 6-78 : New Landside Access Alternative 1F 6-131
Figure 6-79 : Refined Landside Access Alternative 2D 6-133
Figure 6-80 : Terminal Curbside Lane Configuration Alternative 1 6-137
Figure 6-81 : Terminal Curbside Lane Configuration Alternative 2 6-139
Figure 6-82 : Terminal Curbside Lane Configuration Alternative 3 6-141
Figure 6-83 : PRT Alignment Alternative 1 6-143

Figure 6-84 : PRT Alignment Alternative 2 6-145
Figure 6-85 : PRT Alignment Alternative 3 6-147
Figure 6-86 : PRT Alignment Alternative 4 6-149
Figure 6-87 : Refined Air Cargo Alternative 3 6-152
Figure 6-88 : Refined GA Development Area Alternative 1 6-153
Figure 6-89 : Refined West Side Aviation Area Alternative 2 6-157
Figure 6-90 : Preferred Support Facility Development and GSE Considerations 6-159
Figure 6-91 : Preferred Airprot Development Concept Land Use 6-161
Figure 6-92 : Preferred Airport Development Concept 6-165

6. Alternatives

The Alternatives chapter documents a variety of development alternatives to accomplish the recommended facility improvements identified in Chapter 5, *Facility Requirements.* These alternatives are reviewed, refined, and evaluated across multiple evaluation factors, including documented stakeholder engagement and Airport input, to determine a series of independent recommended improvements to enhance the efficiency of the Greenville-Spartanburg International Airport (GSP or Airport) while meeting prescribed safety standards, facilitating demand projections, and minimizing environmental and community impacts.

This chapter is organized around a series of development alternative graphics, often evolving between themselves and across the chapter sections. These alternatives depict opportunities to address airport design considerations and pre-position the Airport to facilitate future aeronautical demands. Airside alternatives are considered first followed by an evaluation of other components, including the passenger terminal area, landside access, air cargo, general aviation (GA), westside and southside aviation properties, support facilities, and non-aviation land uses.

Alternatives for each functional area are broadly identified initially and select alternatives are then further considered, refined, and scored based on prescribed evaluation factors. Preferred alternatives are then selected to collectively represent the unconstrained 20-year development plan for the Airport.

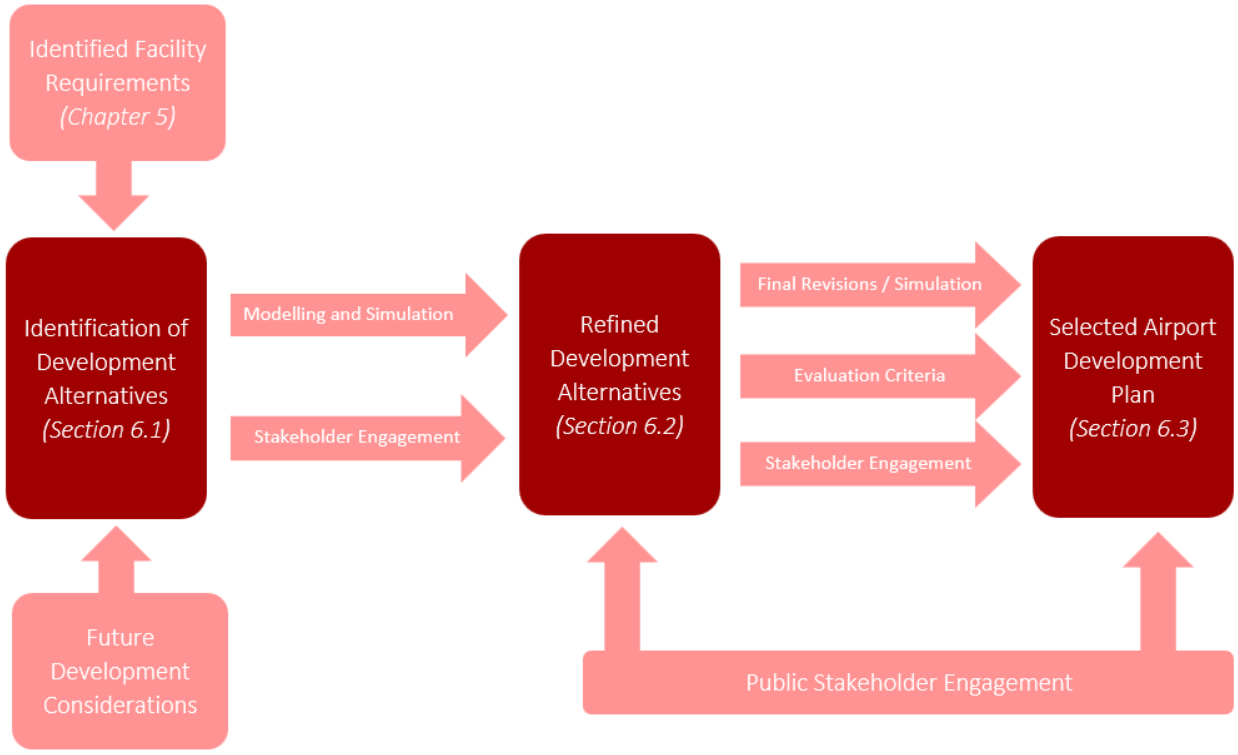
6.1. IDENTIFICATION OF DEVELOPMENT ALTERNATIVES

The following sections will broadly identify initial development alternatives intended to meet known facility requirements as well as additional considerations brought to light by Airport staff and other Airport stakeholders as part of this master plan's public involvement program. Alternatives are grouped in the following functional areas of the Airport and its environs:

- Airside
- Terminal Airside
- Landside Access and Parking
- Air Cargo Facilities
- General Aviation Facilities
- Other Aviation Development Properties
- Support Facilities
- Non-Aviation Land Uses (discussed in Section 6.2.3)

Figure 6-1 provides a flow chart expressing the alternatives development process – the initial identification of development alternatives, elimination and refinement of retained alternatives, and final revision and selection of the preferred airport development plan.

Figure 6-1: Alternative Identification and Refinement Flow Chart



Source: McFarland Johnson, 2018

The identification, evaluation, elimination, refinement, reevaluation, scoring and eventual selection of preferred development plans for each of the functional areas of the Airport was a significant undertaking. The project team engaged in this Master Plan, along with Airport staff, advisory committees, and stakeholder groups, spent countless hours contemplating and reviewing growth opportunities at GSP. The product of that collective effort which spanned nearly seven months is expressed in this chapter.

6.1.1. Airside Alternatives

The airside alternatives presented in the following sections are focused strictly on the movement areas of the airfield and explore the ability to better meet geometric standards prescribed by the FAA and provide the airfield facilities required to meet aeronautical demand over the 20-year planning period and beyond.

Airside alternatives are primarily concerned with improving geometry issues to better meet airport design standards, provide for specific demands of aircraft type, or otherwise support a more safe and efficient airfield. The facility requirements, as identified in Chapter 5, *Facility Requirements*, existing issues, and other considerations that triggered the development of the airside alternatives are discussed below for each area of the airfield.

- **Parallel Runway:** The previous airport master plan investigated a parallel runway south of Runway 4-22 as redundancy measure to lessen the impacts to operations from closures to the primary runway. In like manner, this master plan investigated a future parallel runway

to provide a more efficient airfield as operations by airlines, cargo operators, and GA aircraft increase over time. A parallel runway would better separate traffic and lessen the impact of primary runway closures for rehabilitation. Considerations for terrain and local environmental resources were included in the placement of the proposed parallel runway. The length of the parallel runway was dependent on meeting Runway Protection Zone (RPZ) land control requirements while providing enough length to provide an adequate redundancy for the aircraft frequently operating at GSP.

- **Crossfield Taxiway:** Crossfield taxiway alternatives were necessary to support the proposed parallel runway. Considerations for critical aircraft requirements, terrain, and operational efficiency and redundancy were considered for the development of these alternatives.

- **Taxiways E and F:** Taxiways E and F currently do not meet FAA geometry standards to avoid wide expanses of pavement, co-located rapid exit taxiways, multiple taxiway crossings, and direct access taxiways as defined in FAA Advisory Circular (AC) 150/5300-13A*, Airport Design*. The taxiway pavement in this area is in poor condition, which was taken into consideration for the development of this alternative. Additionally, these taxiways are not frequently used by aircraft accessing the Air Carrier Apron as the majority of arriving airlines miss these exit taxiways and are required to exit via Taxiways D or G.

- **Taxiway L2:** Taxiway L2 currently does not meet FAA geometry standards to avoid direct access taxiways. Since Taxiway L2 connects to Taxiway D without requiring pilots to make a distinct turn, it is considered direct access. Since the apron area to the south of Taxiway L2 is currently used for air cargo operations and, when able, to provide for parking positions for aircraft that are scheduled to remain overnight (RON) and the area north has limited aircraft movement capabilities as is, any alternative proposing a shift in Taxiway L2 considered impacts to operations on the associate aprons.

- **Taxiway Fillets:** The existing airfield provides appropriate taxiway filleting for a Taxiway Design Group (TDG)-5 aircraft, which operate at the Airport regularly, in most critical areas of the airfield. However, fillet widening may be warranted at specific intersections to better facilitate movements of widebody aircraft or should aircraft meeting TDG-6 standards begin operating at GSP.

- **Apron Edge Taxilane:** Between Taxiways L3 and L6 there is limited pavement to support aircraft moving between the Transient Apron and the GA Apron. To address this, a series of alternatives were developed to expand the pavement of the connector taxiways to Taxiway L, the connector taxiway between the Transient and the GA Apron. Relocation of the apron edge taxilane to be in-line and fully connected to the commercial apron edge taxilane will provide for better mobility of aircraft about the GSP campus as well as provide a small expansion to the GA apron area.

- **Approach Lighting System:** Runway 4 is currently equipped with a 2,400-ft Approach Lighting System with Sequence Flashers II (ALSF-2) to support CAT II and III approaches. To improve the operational flexibility and efficiency of the Airport, an alternative proposing an ALSF-2 to support Runway 22 was developed.

- **Runway Entrance/Exit Taxiway:** An alternative was developed based on the potential benefit of constructing a runway entrance/exist taxiway between Taxiways G and J.

- **90-degree Apron Entrance:** Currently, Taxiway L9 intersects the North Cargo Apron at an angle, which limits the parking capabilities for large cargo aircraft. By straightening the taxiway entrance to a 90-degree intersection, an additional cargo aircraft parking spot will be made available full time.

Table 6-1 identifies the initial airside alternatives developed, geometric/facility requirements each is intended to address, and the associated figure for each. The facility requirements were supplemented to include future development considerations identified through public stakeholder comments. Figure 6-2 through Figure 6-22 depict the initial airside alternatives developed. The considerations for each alternative functional area are listed below with the resulting details shown in respective figures. Further discussion of the alternatives selected for further refinement included in Section 6.2.2.

- **Parallel Runway:** Three initial alternatives were reviewed for a parallel runway at the Airport. The parallel runway proposes an associated full-length parallel taxiway in each scenario and each is paired with a series of crossfield taxiway alternatives to connect the runway to the existing airfield (as shown in Figure 6-5 through Figure 6-7).

- **Crossfield Taxiway:** Three initial alternatives were reviewed for crossfield taxiways to support the proposed parallel runway south of Runway 4-22. The variation in crossfield taxiway layouts were developed to accommodate operations by ADG-III (supportive of commercial service aircraft) aircraft accessing different parts of the airfield.

- **Taxiways E and F:** Five initial alternatives were developed to address the non-standard conditions.

- **Taxiway L2:** Two initial alternatives were developed to address this non-standard direct access condition.

- **Taxiway Fillets:** One initial alternative was developed to show the widening of Taxiways A, B, J, and K to meet TDG-6 standards to allow more efficient movement of widebody aircraft.

- **Apron Edge Taxilane:** Four initial alternatives were developed to construct an apron edge taxilane between the General Aviation and Air Carrier Aprons. Variations among alternatives seek to accommodate operations by aircraft ranging from TDG-2 to TDG-4.

- **Approach Lighting System:** One initial alternative proposing the installation of a 2,400-ft ALSF-2 to support precision approaches to Runway 22 be developed.

- **Runway Entrance/Exit Taxiway:** One initial alternative was developed to enhance the efficiency of operations at the Airport by constructing an additional entrance and exit taxiway between Taxiways G and J.

- **90-degree Apron Entrance:** One initial alternative was developed to reconfigure Taxiway L9 to maintain a 90-degree intersection angle with the North Cargo Apron. Currently, Taxiway L9 is angled which limits the parking capabilities for large cargo aircraft on the North Cargo Apron.

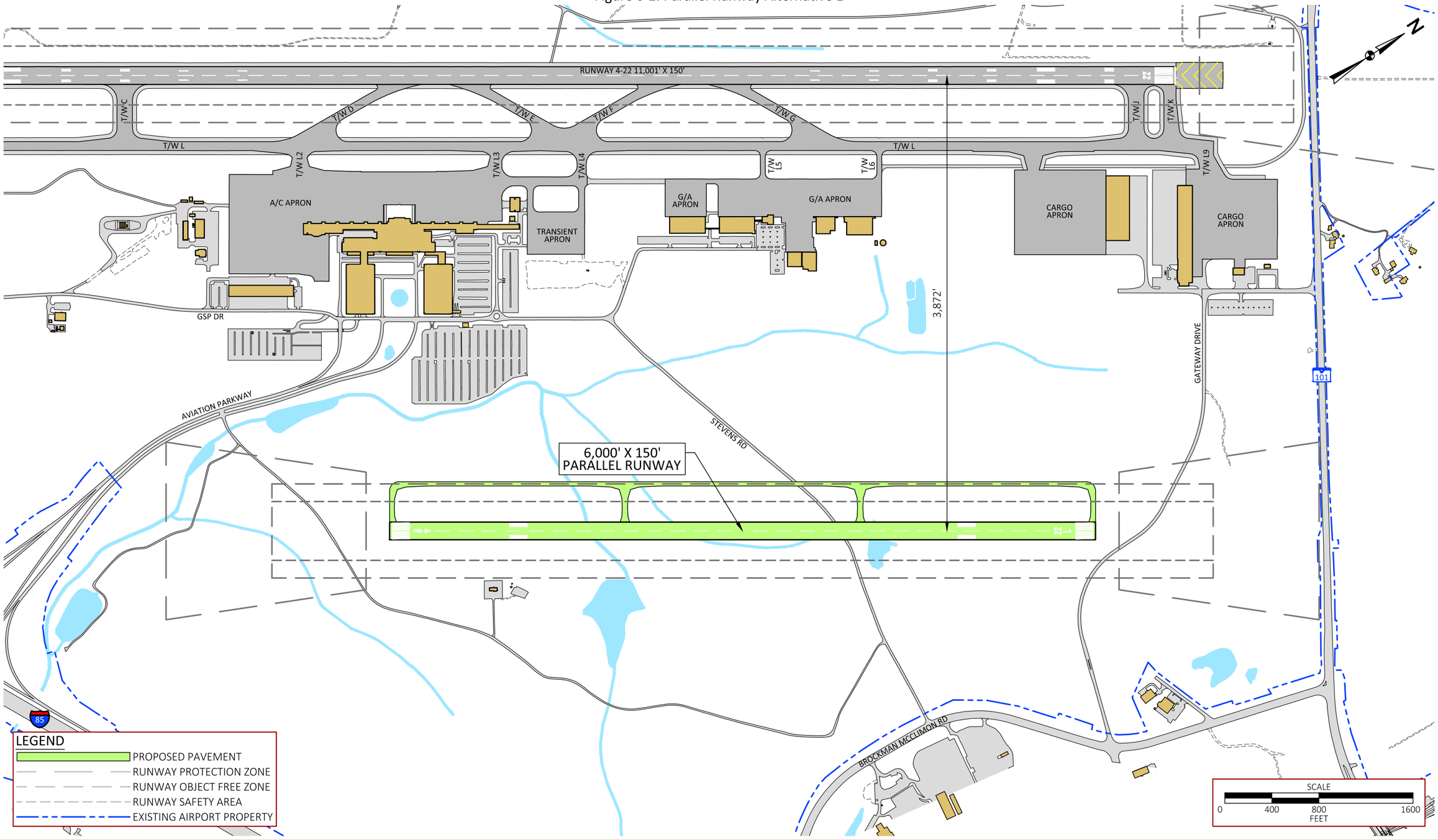
Table 6-1: Identified Airside Alternatives

Geometry/Facility Requirement	Initial Alternatives	Figure
Parallel Runway	6,000' RWY – 3,872' SE of RWY 4-22	Figure 6-2
	6,500’ RWY – 4,300’ SE of RWY 4-22	Figure 6-3
	7,000' RWY – 4,300' SE of RWY 4-22	Figure 6-4
Crossfield Taxiway	ADG-III dual parallel on Transient Apron	Figure 6-5
	ADG-III dual parallel off Transient Apron	Figure 6-6
	Split ADG-III dual parallel - Transient/Cargo Apron	Figure 6-7
Wide Expanse of Pavement	TWY F Removal	Figure 6-8
	TWY E & F Removal	Figure 6-9
Co-Location of Rapid Exit Taxiway	Relocate TWY F South	Figure 6-10
	Remove TWY E & F, Add 90° TWY	Figure 6-11
Direct Access	Relocate TWY F North	Figure 6-12
Direct Access	Relocate TWY L2 South	Figure 6-13
	Relocate TWY L2 North	Figure 6-14
Taxiway Fillet	Fillet Widening for TDG-6 on TWY A/B/J/K	Figure 6-15
Apron Edge Taxilane	TDG-2 TWY Between TWY L4 and GA Apron	Figure 6-16
	TDG-3 TWY Between TWY L4 and GA Apron	Figure 6-17
	TDG-3/2 TWY Between TWY L4 and TWY L6	Figure 6-18
	TDG-4/3 TWY Between TWY L4 and TWY L6	Figure 6-19
Approach Lighting System	2,400' ALSF-2 in RWY 22 Approach Zone	Figure 6-20
Runway Entrance/Exit Taxiway	TWY H Development	Figure 6-21
90° Apron Entrance	TWY L9 Realignment	Figure 6-22

Note: ADG = Airplane Design Group; TDG = Taxiway Design Group; TWY = Taxiway; ALSF-II = Approach Lighting System with Sequence Flashing Lights.
Source: McFarland Johnson, 2018

This page has been intentionally left blank.

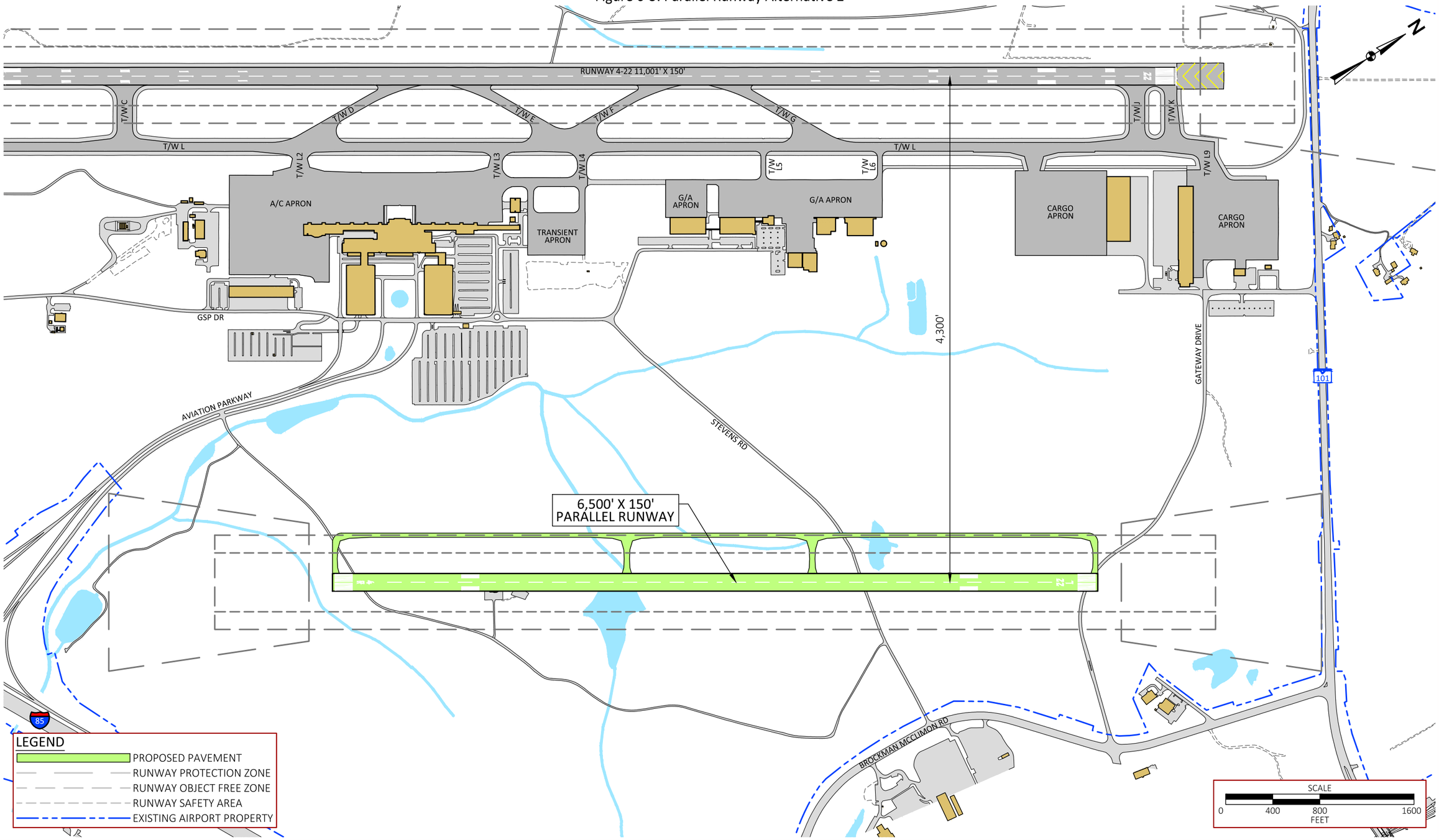
Figure 6-2: Parallel Runway Alternative 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-RUNWAY.dwg

This page has been intentionally left blank.

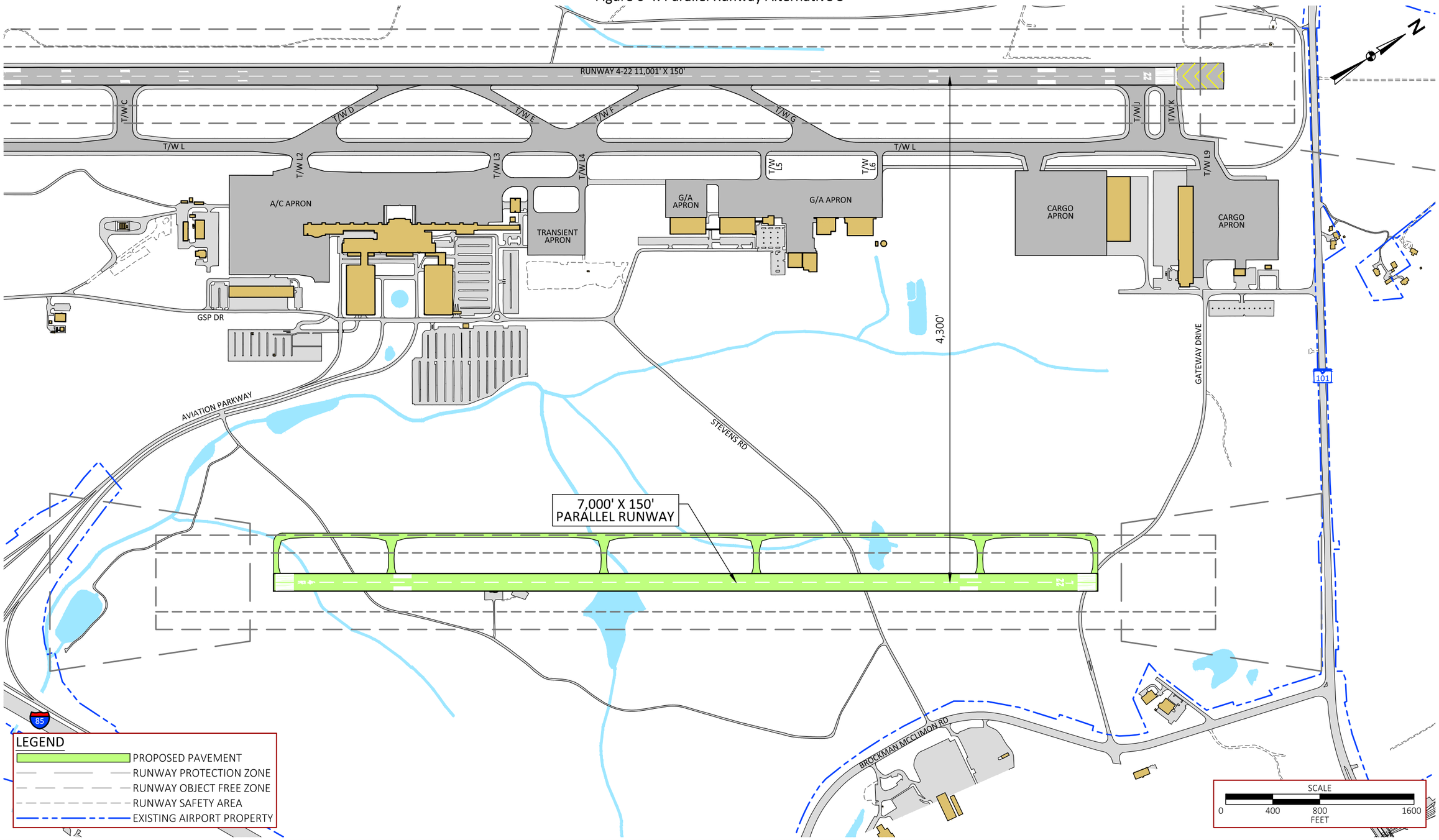
Figure 6-3: Parallel Runway Alternative 2



K:\Greenville Spartanburg\T-182219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-RUNWAY.dwg

This page has been intentionally left blank.

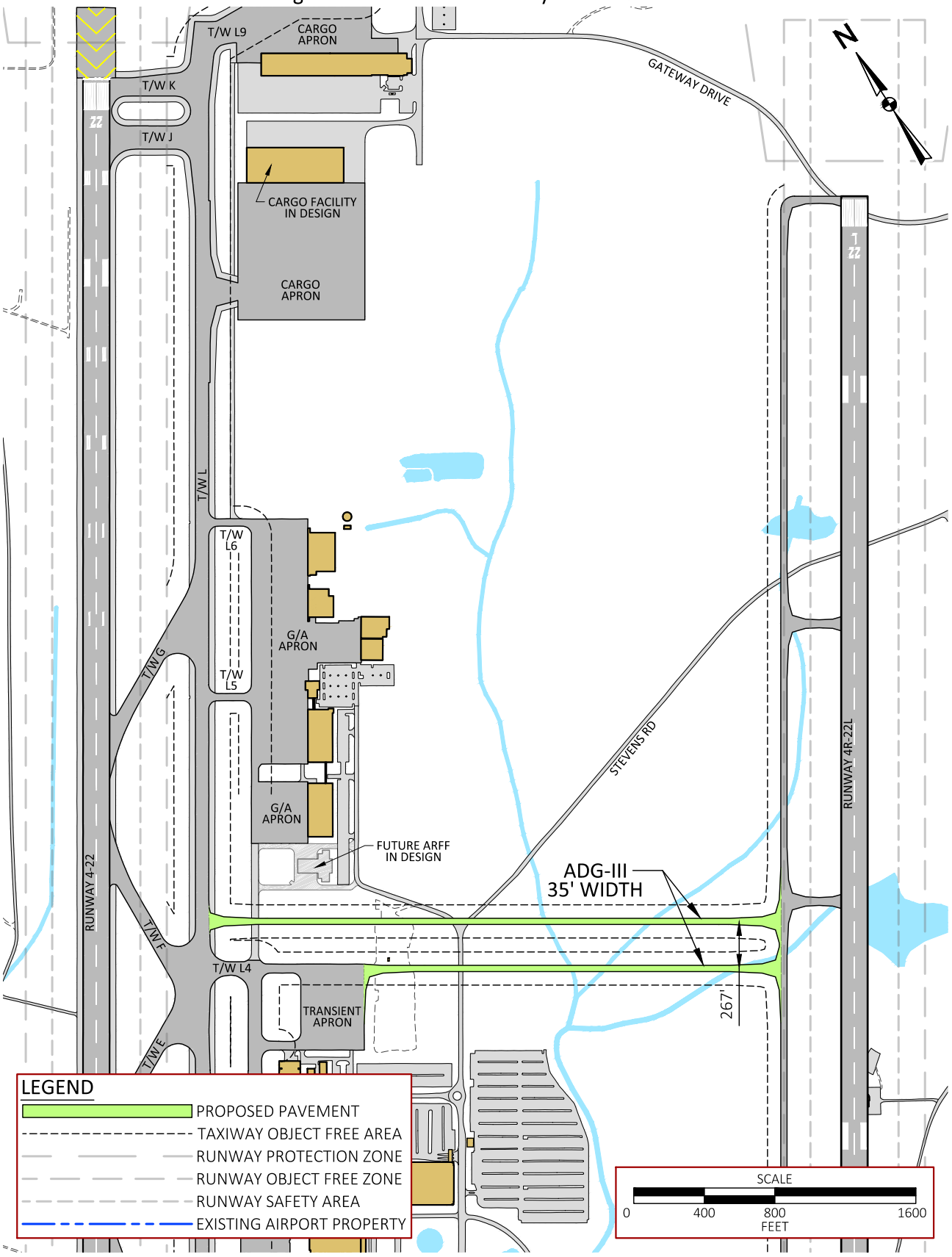
Figure 6-4: Parallel Runway Alternative 3



K:\Greenville Spartanburg\T-182219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-RUNWAY.dwg

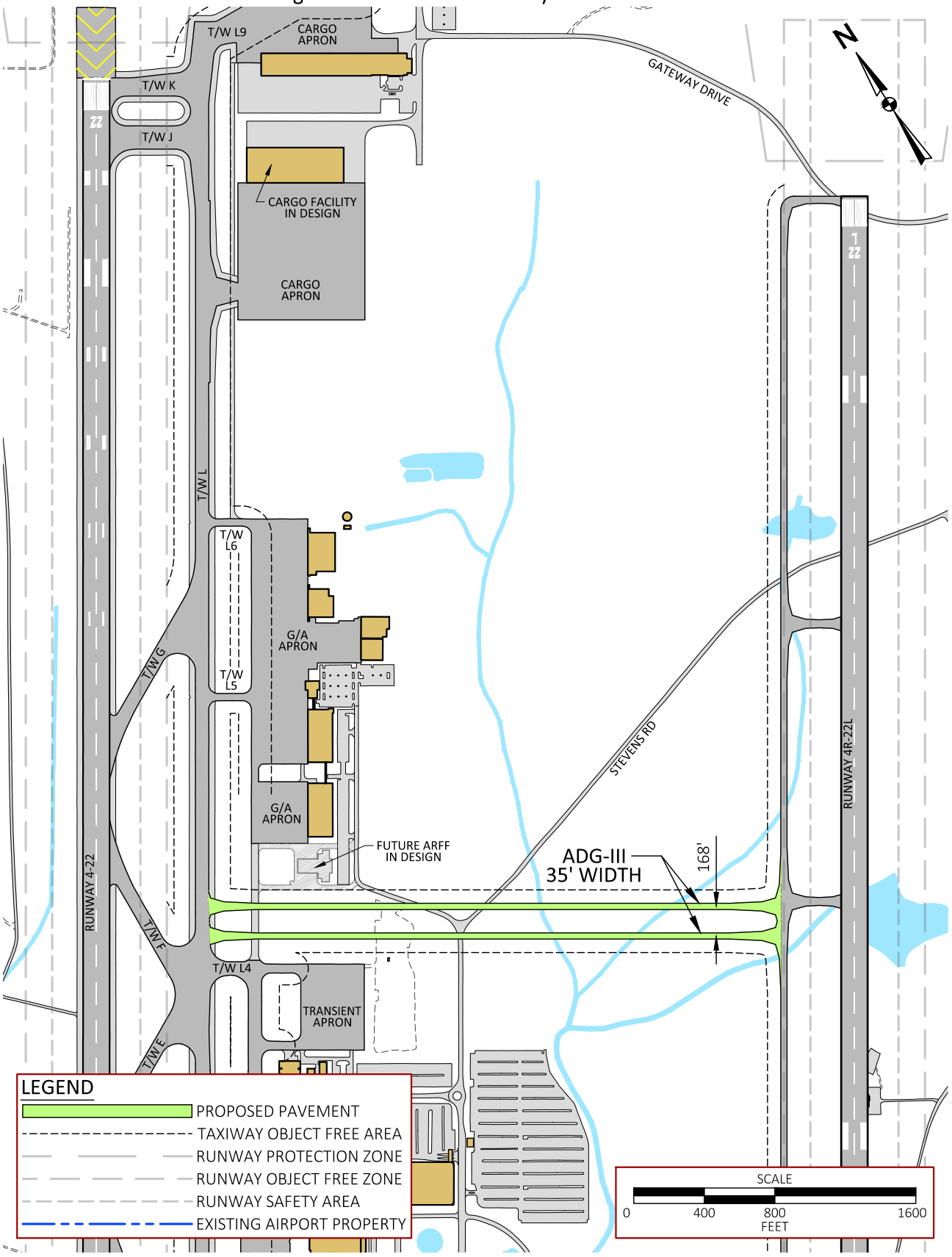
This page has been intentionally left blank.

Figure 6-5: Crossfield Taxiway Alternative 1



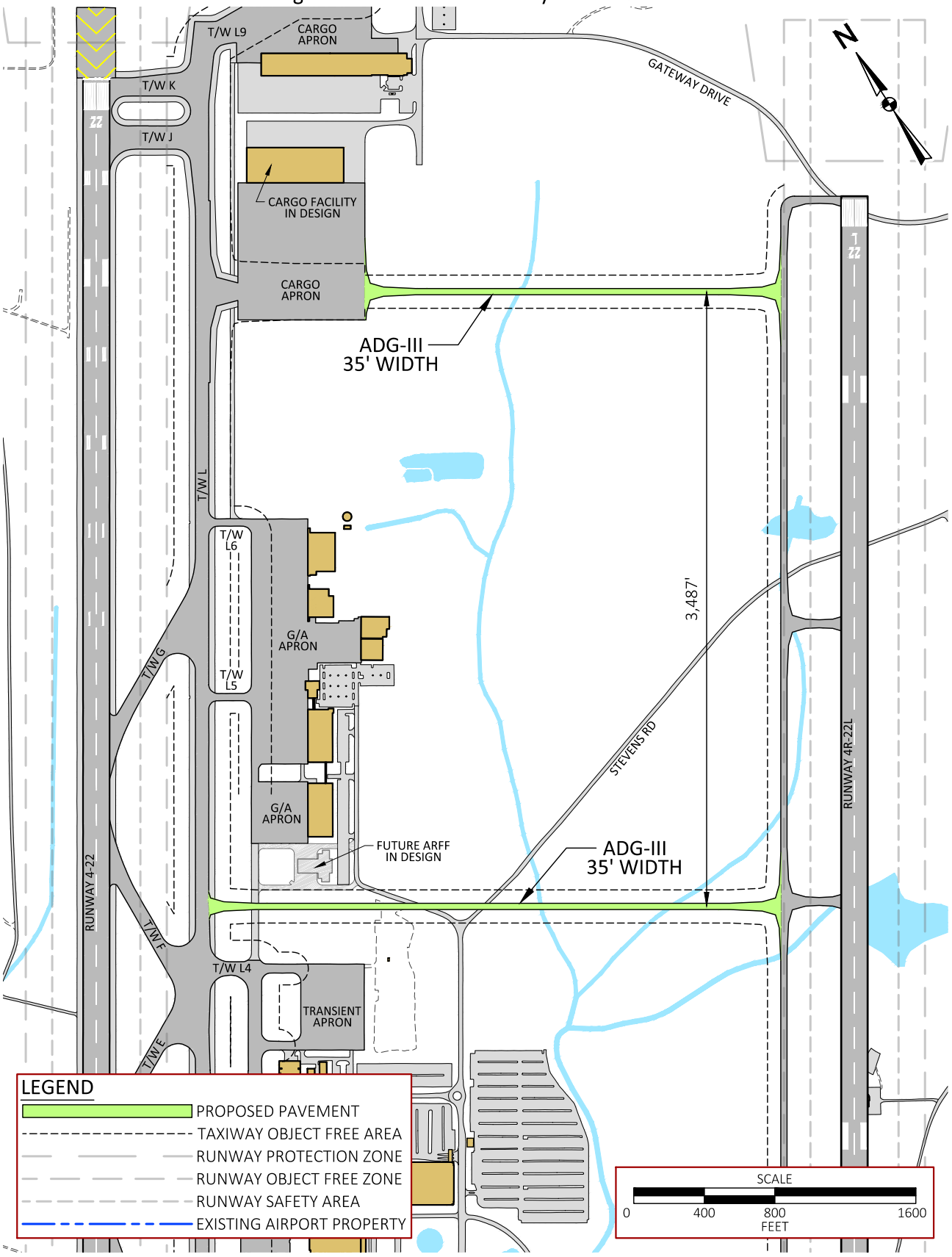
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY CROSSFIELD.dwg

Figure 6-6: Crossfield Taxiway Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY CROSSFIELD.dwg

Figure 6-7: Crossfield Taxiway Alternative 3



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY CROSSFIELD.dwg

This page has been intentionally left blank.

LEGEND
PROPOSED PAVEMENT
REMOVED PAVEMENT
AIRPORT PROPERTY LINE

Figure 6-8: Taxiway F Removal

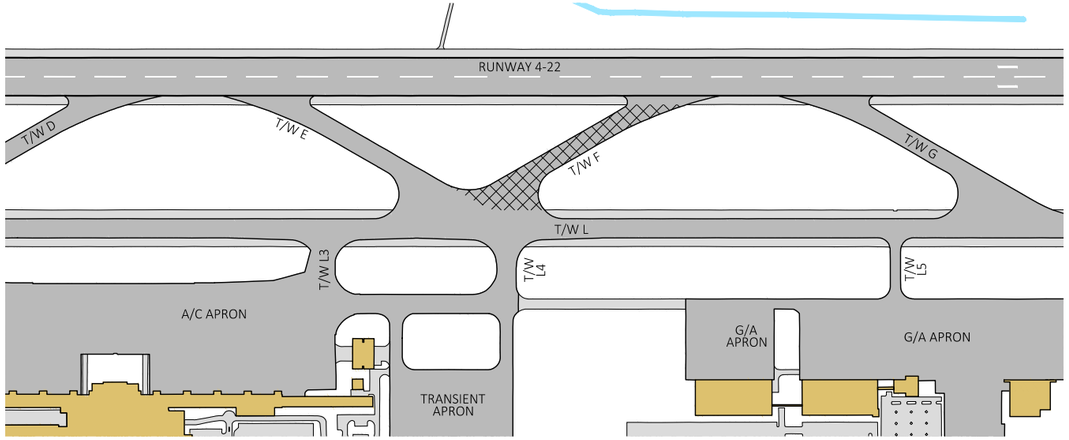


Figure 6-9: Taxiway E & F Removal

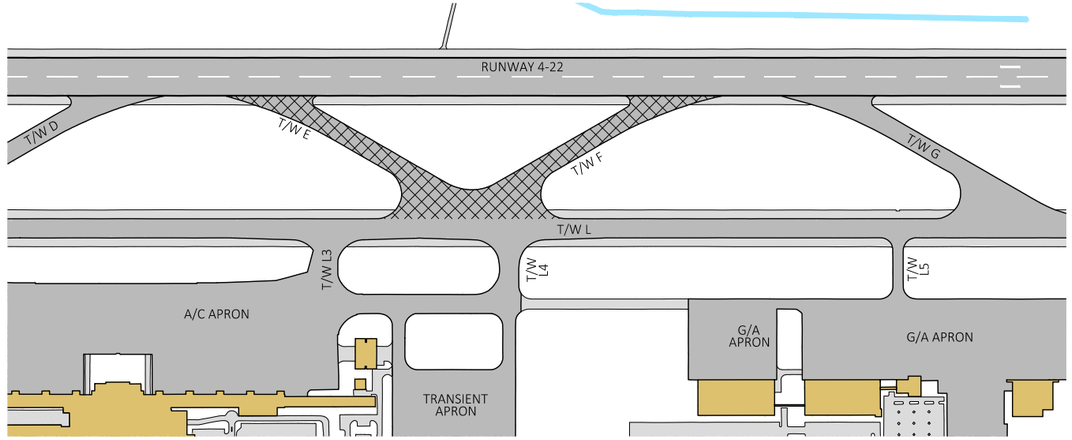


Figure 6-10: Relocated Taxiway F South

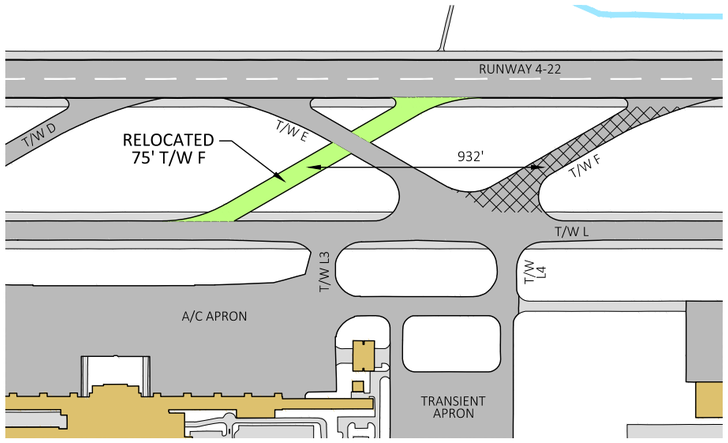


Figure 6-11: Taxiway E & F Replacement with 90° Connector Taxiway

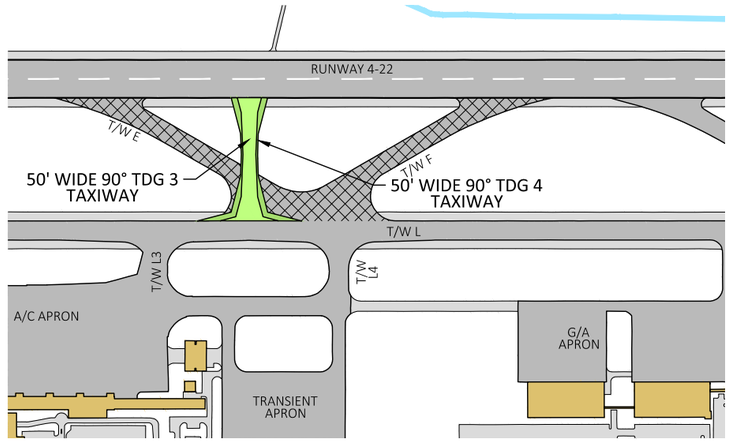
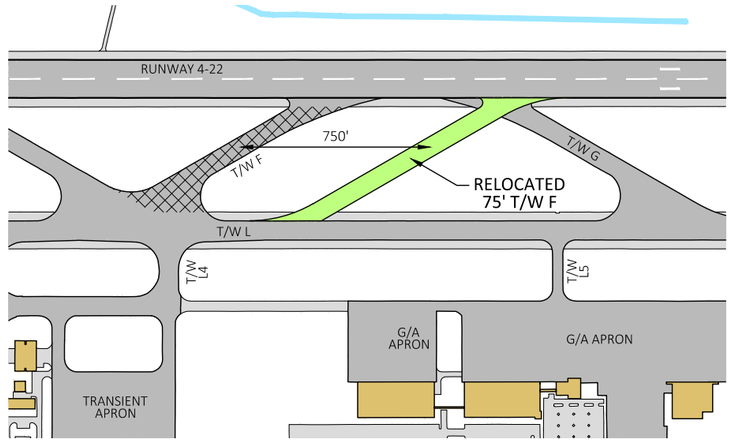


Figure 6-12: Relocated Taxiway F North



SCALE
0 300 600 1200
FEET

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY E F.dwg

This page has been intentionally left blank.

Figure 6-13: Relocated Taxiway L2 South

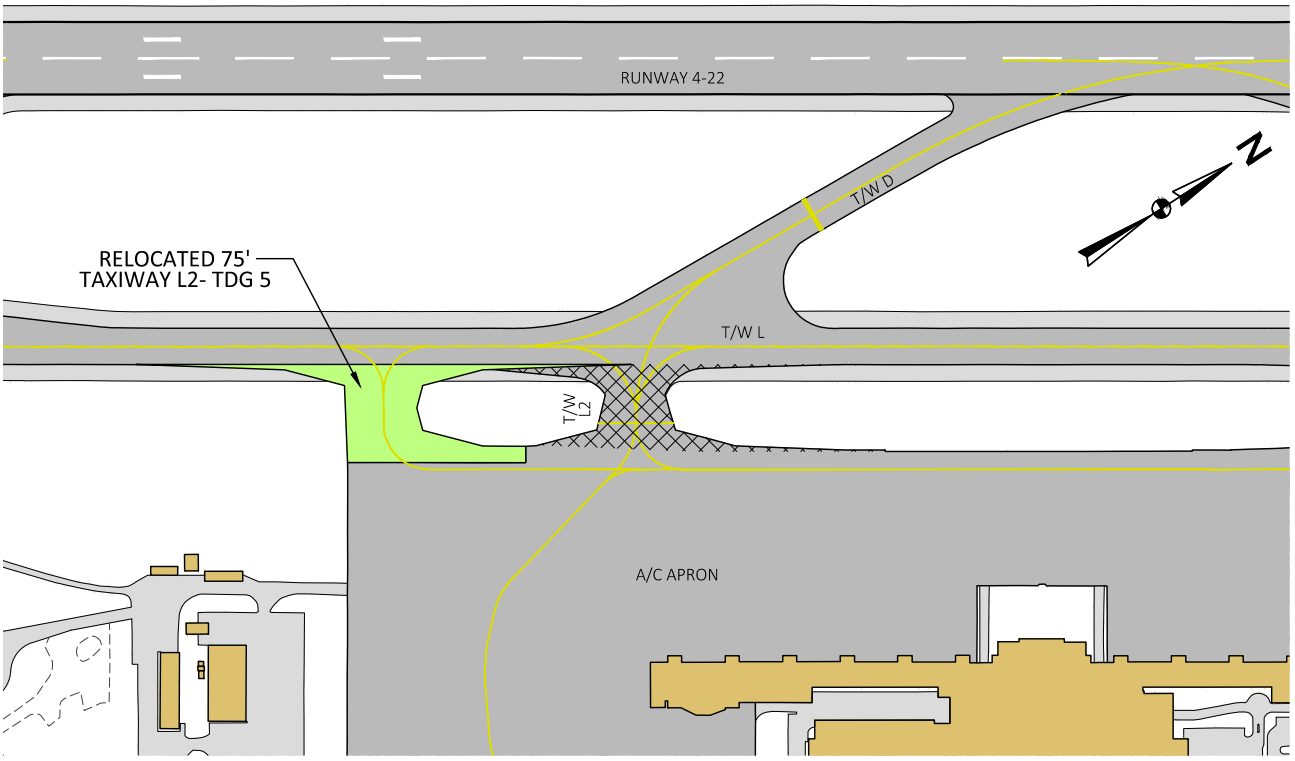
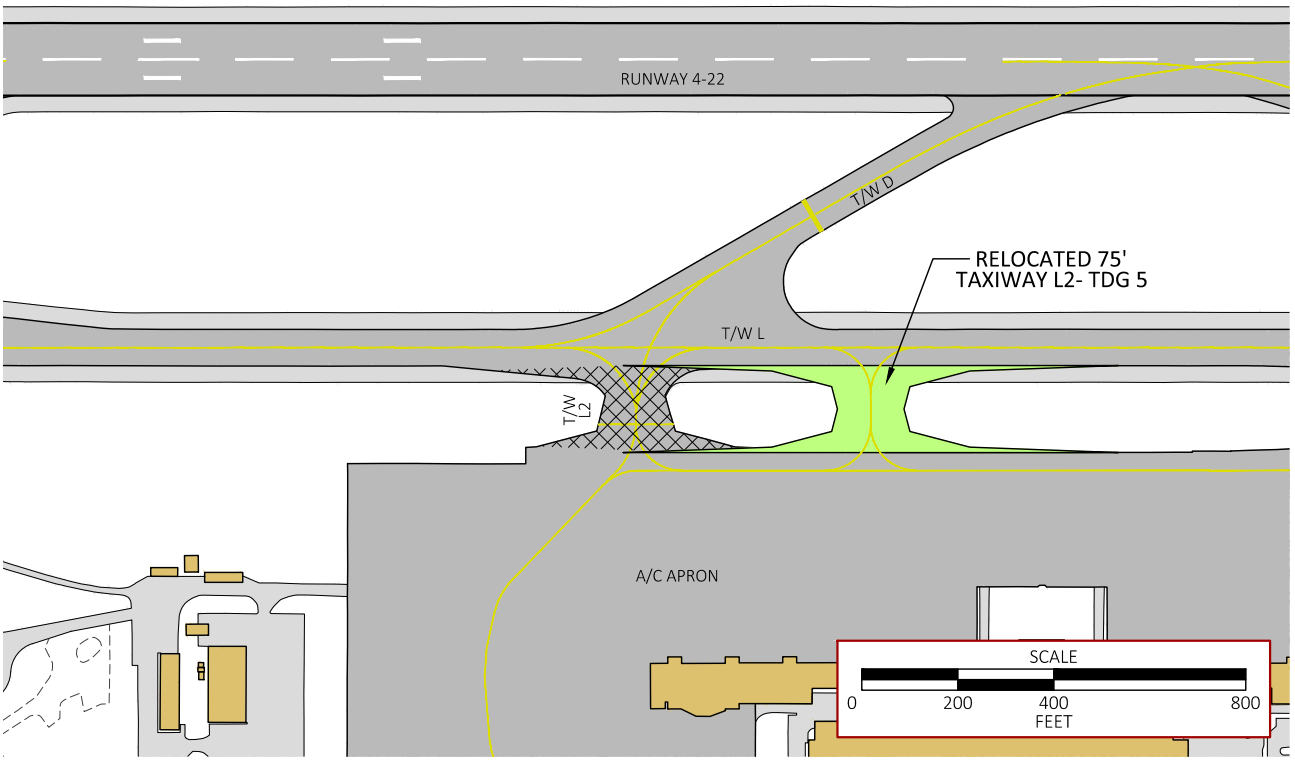


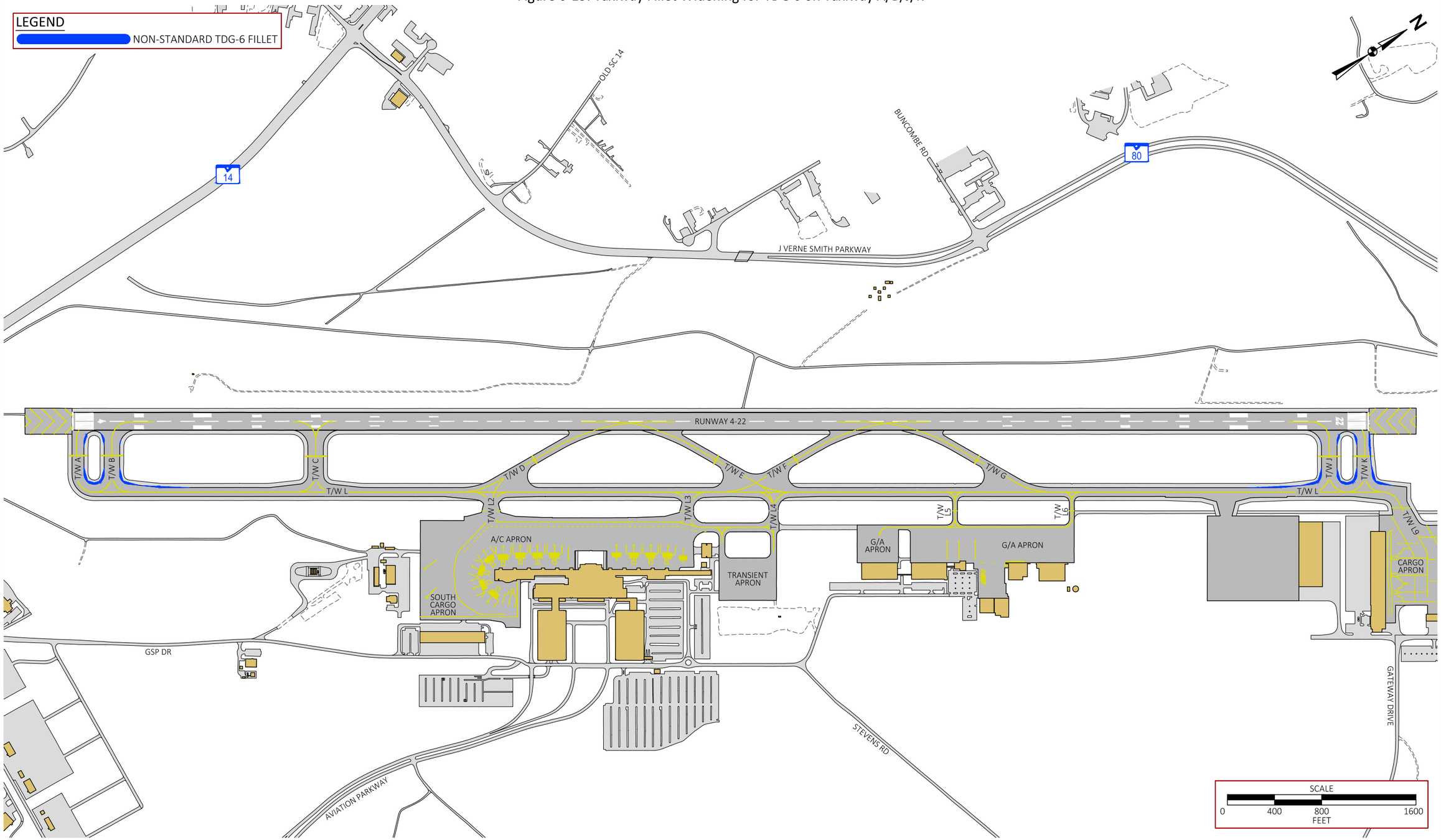
Figure 6-14: Relocated Taxiway L2 North



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY L2.dwg

This page has been intentionally left blank.

Figure 6-15: Taxiway Fillet Widening for TDG 6 on Taxiway A/B/J/K



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-FILLET.dwg

This page has been intentionally left blank.

LEGEND
PROPOSED PAVEMENT
AIRPORT PROPERTY LINE

Figure 6-16: Apron Edge Taxilane Alternative 1

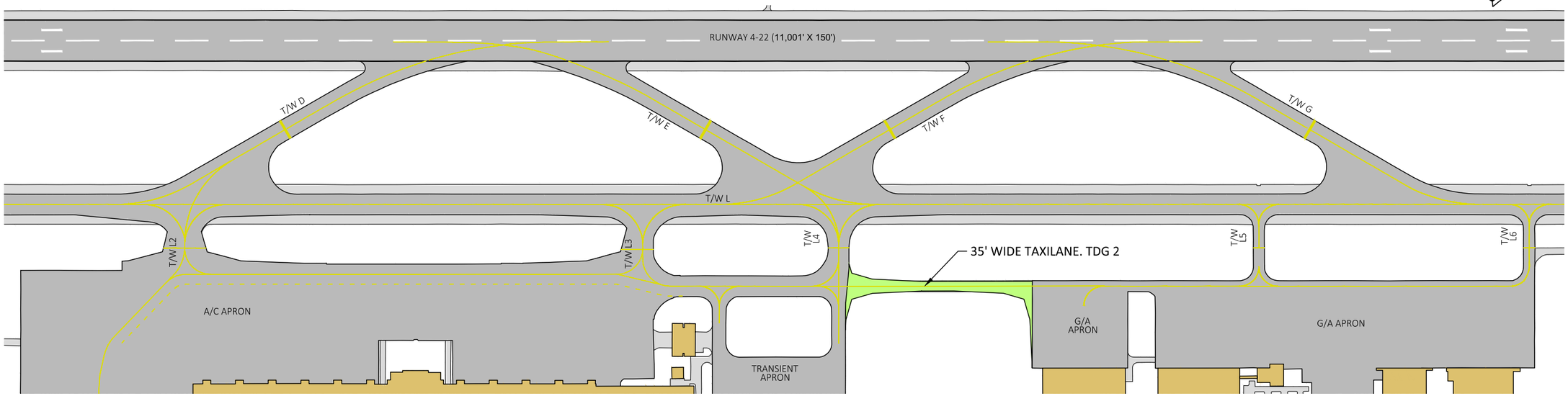
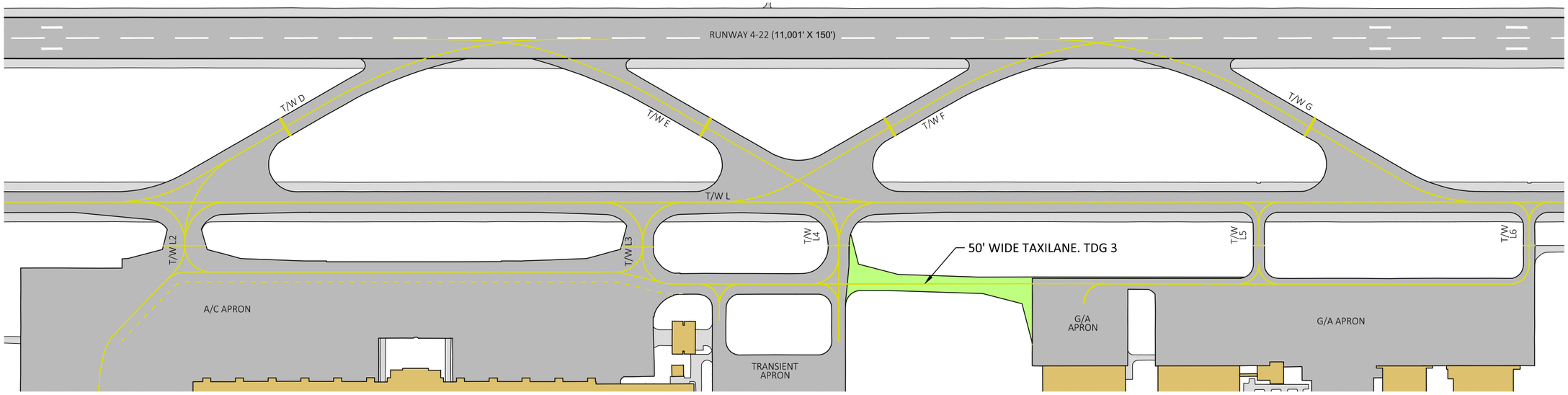


Figure 6-17: Apron Edge Taxilane Alternative 2



SCALE
0 200 400 800
FEET

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXILANE CONNECTOR.dwg

This page has been intentionally left blank.

Figure 6-18: Apron Edge Taxilane Alternative 3

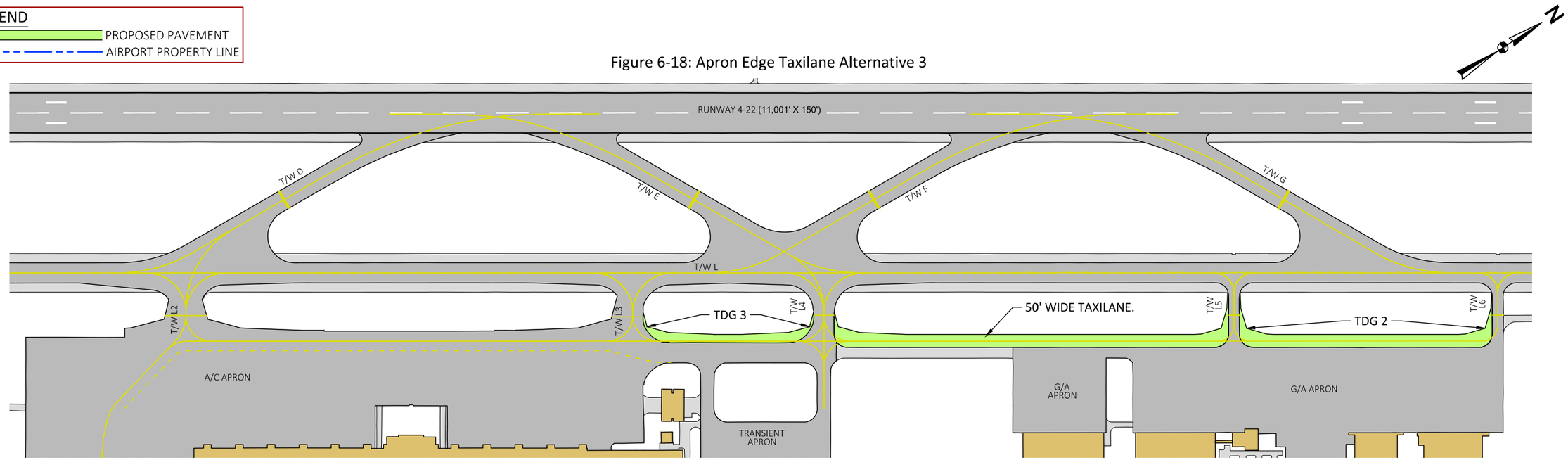
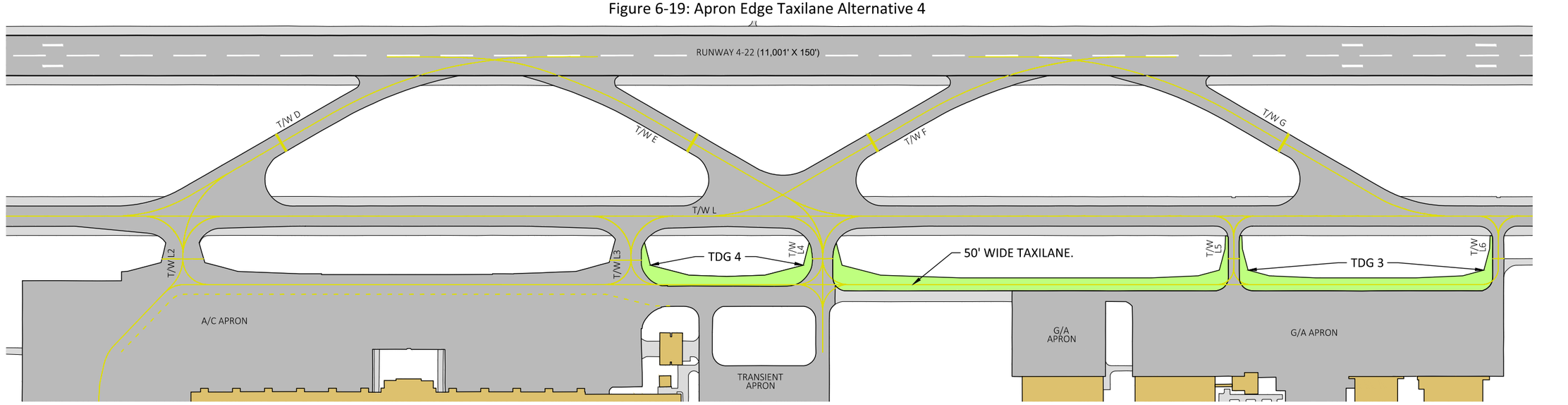


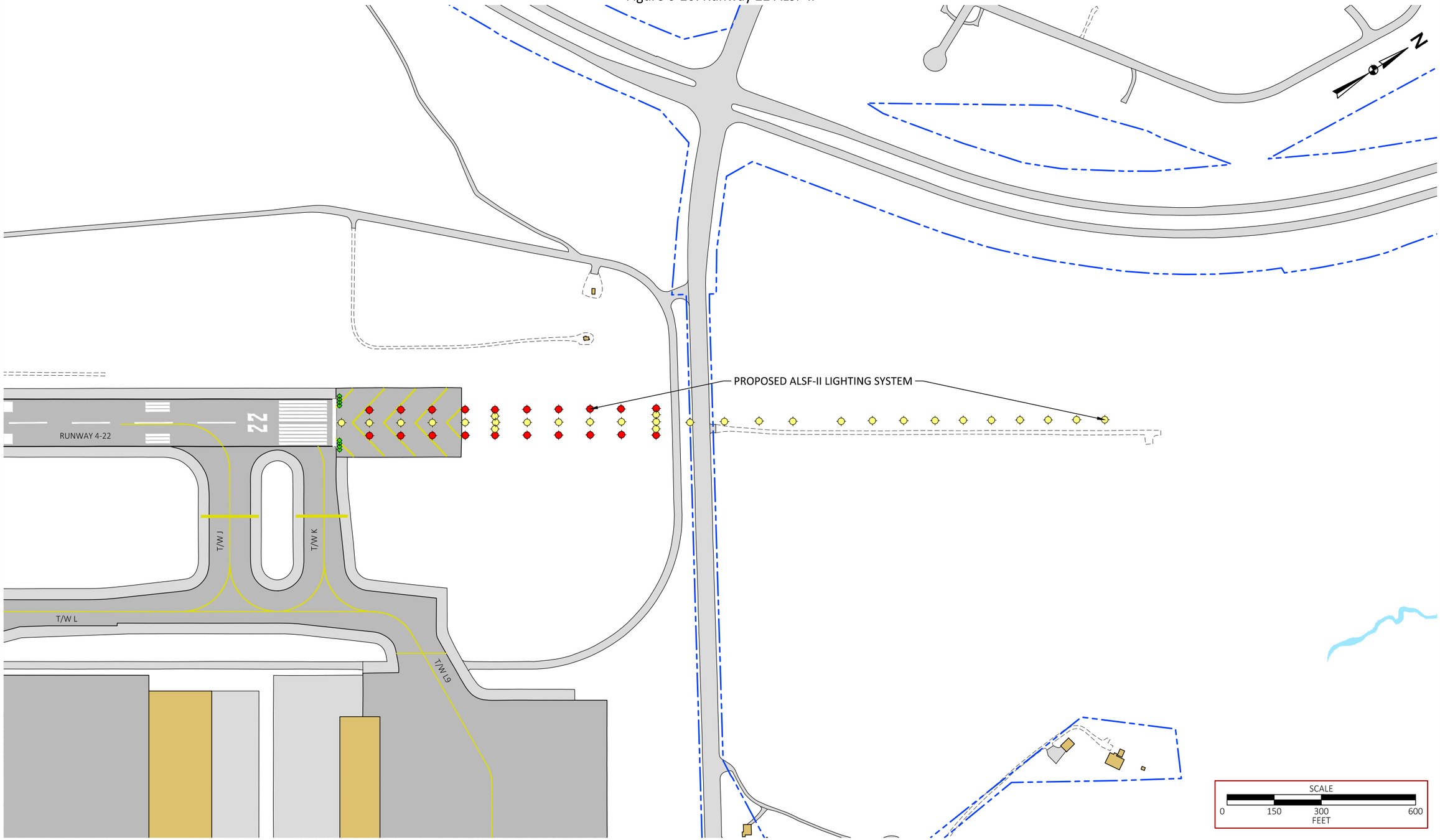
Figure 6-19: Apron Edge Taxilane Alternative 4



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXILANE CONNECTOR.dwg

This page has been intentionally left blank.

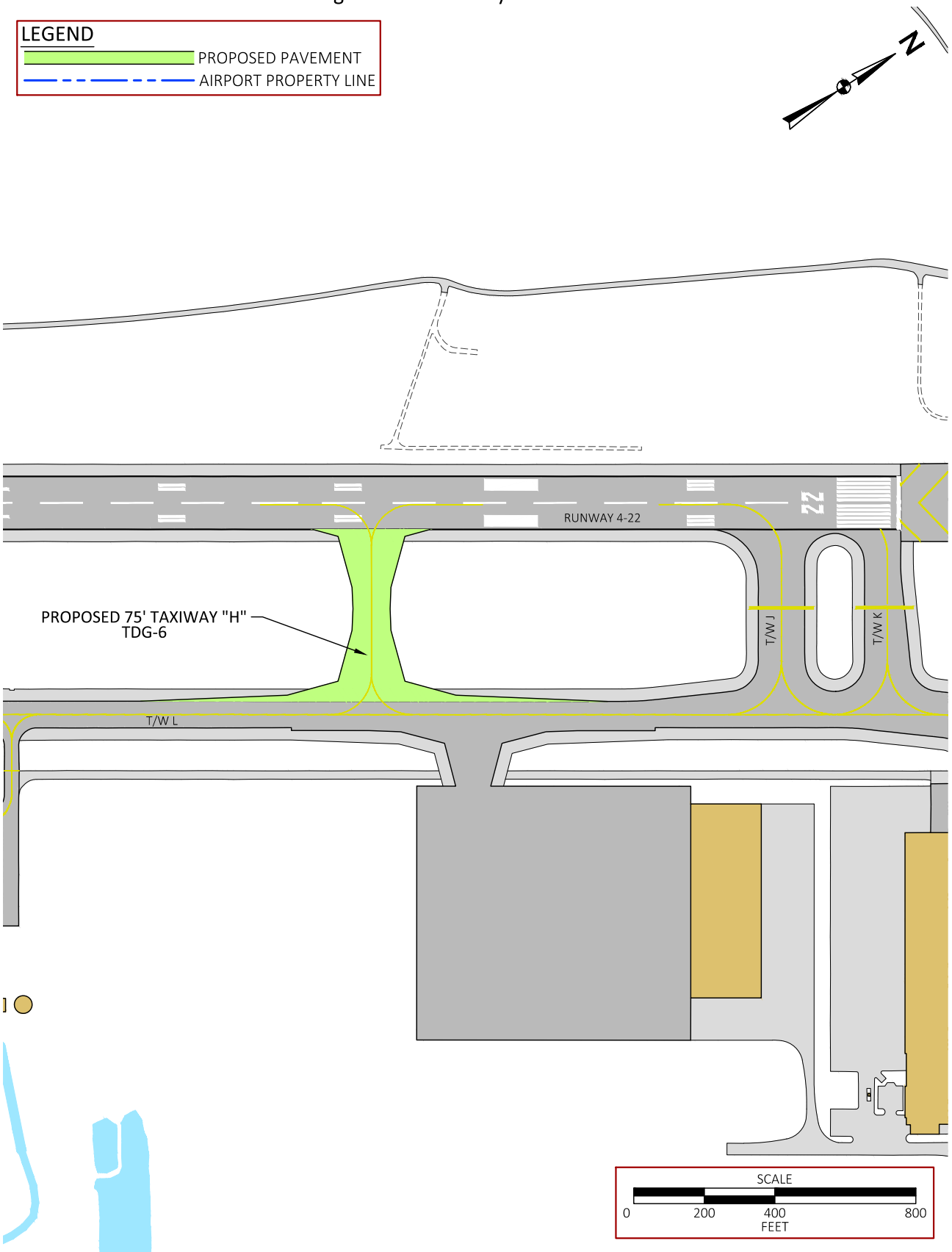
Figure 6-20: Runway 22 ALSF-II



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-RUNWAY 22 APPROACH.dwg

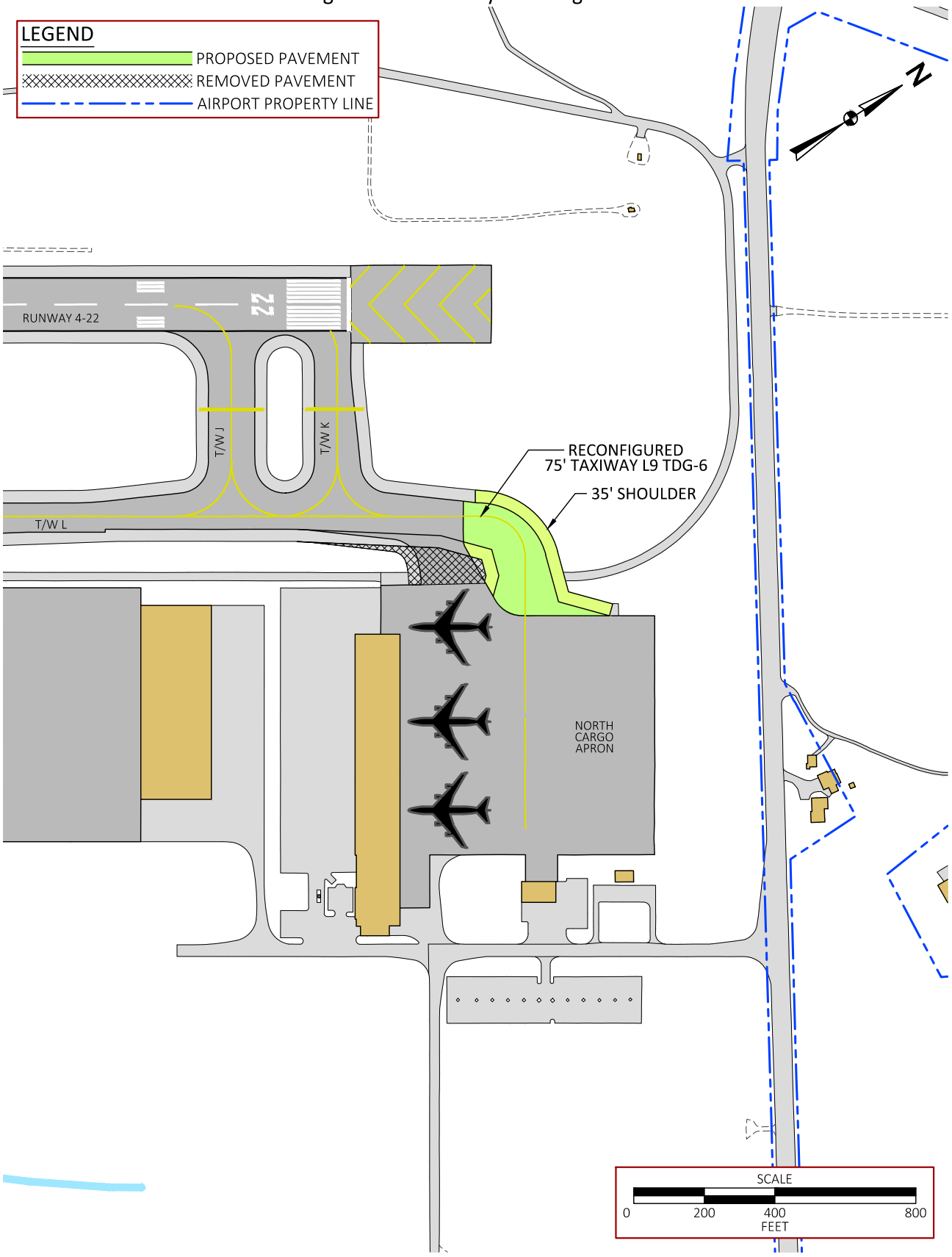
This page has been intentionally left blank.

Figure 6-21: Taxiway H Alternative



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY H.dwg

Figure 6-22: Taxiway L9 Realignment



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY L9.dwg

6.1.2. Terminal Airside Alternatives

The terminal airside alternatives presented in the following sections focus on the commercial terminal apron area, gated aircraft positions, and ancillary airside terminal building requirements anticipated across the planning period and beyond. Care was taken to develop a multitude of terminal/apron configurations to express the overall utility of existing pavement and terminal-reserved lands within the terminal campus, which includes the South Cargo Apron, Concourse A and its supporting apron, Concourse B and its supporting apron, and the Transient Apron area. Additionally, most development concepts include ground boarding and international variations to evaluate the flexibility of proposed layouts. These alternatives were then further refined and paired as discussed in Section 6.2.2.

The linear and Concourse A focused terminal growth plan that was presented in the Airport's previous master plan was seen during the course of this master plan to unnecessarily encumber high-strength concrete apron areas currently used as the South Cargo apron and would eventually encounter lateral growth limitations by the Airport maintenance yard. Although, linear development alternatives were prepared, so too were hammer head designs, rotunda designs, and other non-linear options.

Additionally, considering the anticipated relocation of Airport Traffic Control Tower (ATCT) and the Aircraft Rescue and Firefighting (ARFF) facilities at GSP, a strong desire to develop a balanced terminal system between the concourses was recognized. As such, alternatives for expansion to Concourses A and B were explored for their ability to work in unison to provide for anticipated future needs while maximizing the utility of existing Airport facilities. Additional considerations that supplemented the development of the terminal airside alternatives are discussed below.

- Gated Aircraft Parking Positions: Chapter 5 identifies a requirement of 15 total passenger boarding gates by 2037. Should the Airport reach 2 million annual enplanement passengers (MAEP), 18 total gates will be required. At 3.5 MAEP, 28 total gates will be required. With 13 existing gates at the Airport, alternatives were development to ensure gate requirements are met throughout the planning period and beyond.

- Widebody Capable Positions: Variations of alternatives were developed to create gate layouts that are compatible with widebody aircraft. This allows for the exploration of how widebody aircraft could be accommodated on the Air Carrier Apron and at a gated hardstand.

- Balanced Terminal Development: Consideration was given to ensure terminal expansion alternatives would remain balanced around the GSP Grand Hall and not disproportionally allocate air traveler activity to any one concourse. This included ensuring development would not impact the efficiency of the Airport's existing facilities. In addition, the provision for a baggage claim expansion in front of Concourse B identified in the 2010 terminal study is shown in all terminal airside alternatives.

- RON Positions: The Airport is realizing a strong demand for RON parking. Once air cargo activity on the South Cargo Apron is relocated to the Air Cargo Apron upon its completion, the South Cargo Apron's high strength pavement will be underutilized. The value of this

pavement to provide for aircraft hardstand positions is included in terminal development alternatives. Any alternatives proposing lateral development of Concourse A considered impacts to this apron area. Potential RON positions within future development layouts for both concourses were included in the development of terminal airside alternatives.

- **De-Icing Areas:** The ability to introduce aircraft de-icing areas to the Air Carrier Apron was investigated as part of terminal airside alternative development. The Airport currently does not have a designated de-icing area and aircraft are de-iced at passenger boarding gates. By integrating a centralized de-icing facility into the future terminal development plan, the Airport will ensure the needs of operators are met efficiently while fully managing runoff of de-icing fluids as operations increase throughout the planning period.

- **Expansion of Ground Storage Equipment (GSE) Apron:** Consideration for an increase in GSE storage space was part of the terminal airside alternative development process. As operations from airlines increase at the Airport, the need for GSE storage will increase. To effectively use valuable apron space for aircraft movement and ensure operator needs are met throughout the planning period, potential expansions of GSE storage areas are shown in several terminal airside alternatives.

- **Terminal 2 Integration:** With aviation forecasts extending beyond the 20-year planning period, a terminal layout that will ultimately support a second terminal to accommodate passenger growth beyond 3 MAEP is included in the development of terminal airside alternatives.

Table 6-2 recognizes each of the Concourse A, Concourse B, and future second terminal alternatives. Figure 6-23 to Figure 6-38 depict the terminal airside alternatives developed. The groupings of each set of terminal airside alternatives are described below with the resulting details shown in respective figures. Further discussion of the alternatives selected for further refinement included in Section 6.2.2.

The following initial alternative groupings were developed for Concourse A. The expansion of the pavement edge of the Air Carrier Apron is included in all appropriate Concourse A alternatives.

- **A1 Alternatives:** This set of initial alternatives were developed with a lateral terminal expansion of Concourse A with narrowbody ground boarding and widebody variations shown. Each alternative provides GSE storage expansion and includes an exit walkway connecting arriving passengers directly to the existing baggage claim area.

- **A2 Alternative:** This initial alternative shows a linear expansion of Concourse A. The existing concourse width would be increased to provide additional room for concessions.

- **A3 Alternatives:** This set of initial alternatives shows the expansion of Concourse A using a rotunda with narrow and widebody variations shown. The international boarding variation would require a shorter rotunda extension to accommodate widebody positions.

- **A4 Alternatives:** This set of initial alternatives were developed with a hammerhead-style expansion of Concourse A with narrow and widebody variations shown. The international

boarding variation would require an offset hammerhead design to accommodate widebody positions.

- **A5 Alternative:** This alternative shows an angled and lateral expansion of Concourse A in an widebody configuration only.

- **A6 Alternatives:** These initial alternatives show L-shaped expansions of Concourse A east and south with both narrow and widebody variations. The ground variation proposes less holdroom space.

The following initial alternative groupings were developed for Concourse B. The expansion of portions of the northern part of the Air Carrier Apron is included in all appropriate Concourse B alternatives.

- **B1 Alternatives:** These initial alternatives were developed with a short, L-shaped terminal expansion of Concourse B with narrow and widebody variations shown.

- **B2 Alternatives:** These alternatives were developed with a longer, L-shaped expansion of Concourse B with narrow and widebody variations shown. These scenarios require additional pavement expansion to support more parking gates and hardstand ground boarding positions.

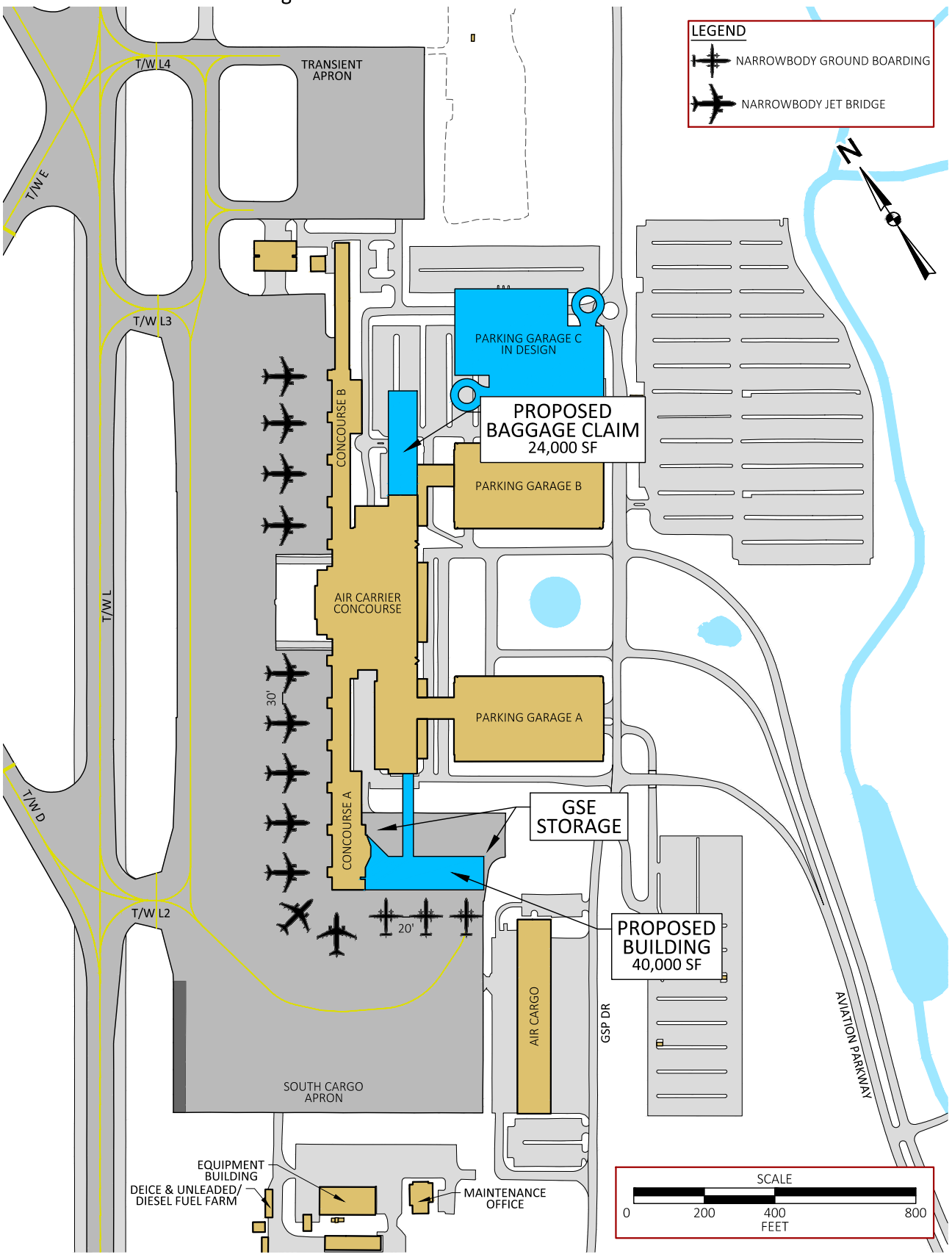
- **B3 Alternatives:** This set of alternatives shows a short, L-shaped expansion of Concourse B partnered with the development of Terminal 2 with narrow and widebody variations. A walkway connector is shown between the Concourse C expansion and Terminal 2 in both scenarios.

Table 6-2: Identified Terminal Airside Alternatives

Focus	Initial Alternatives	Figure
Concourse A	Terminal Alternative A1 – Ground	Figure 6-23
	Terminal Alternative A1 – International	Figure 6-24
	Terminal Alternative A2	Figure 6-25
	Terminal Alternative A3 – Ground	Figure 6-26
	Terminal Alternative A3 – International	Figure 6-27
	Terminal Alternative A4 – Ground	Figure 6-28
	Terminal Alternative A4 – International	Figure 6-29
	Terminal Alternative A5 – International	Figure 6-30
	Terminal Alternative A6 – Ground	Figure 6-31
	Terminal Alternative A6 – International	Figure 6-32
Concourse B	Terminal Alternative B1 – Ground	Figure 6-33
	Terminal Alternative B1 – International	Figure 6-34
	Terminal Alternative B2 – Ground	Figure 6-35
	Terminal Alternative B2 – International	Figure 6-36
Terminal 2	Terminal Alternative B3 – Domestic	Figure 6-37
	Terminal Alternative B3 – International	Figure 6-38

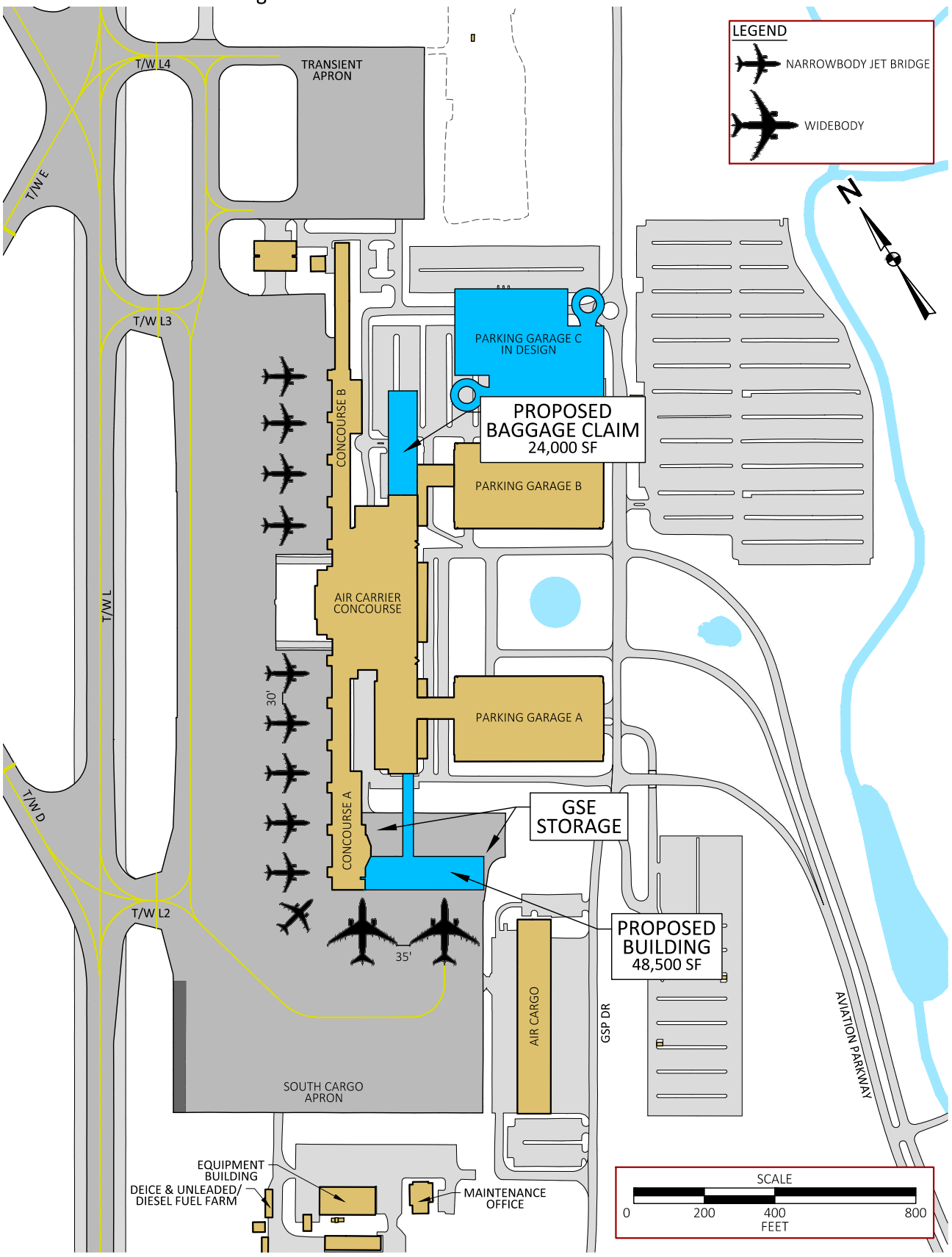
Source: McFarland Johnson, 2018

Figure 6-23: Terminal Alternative A1 - Ground



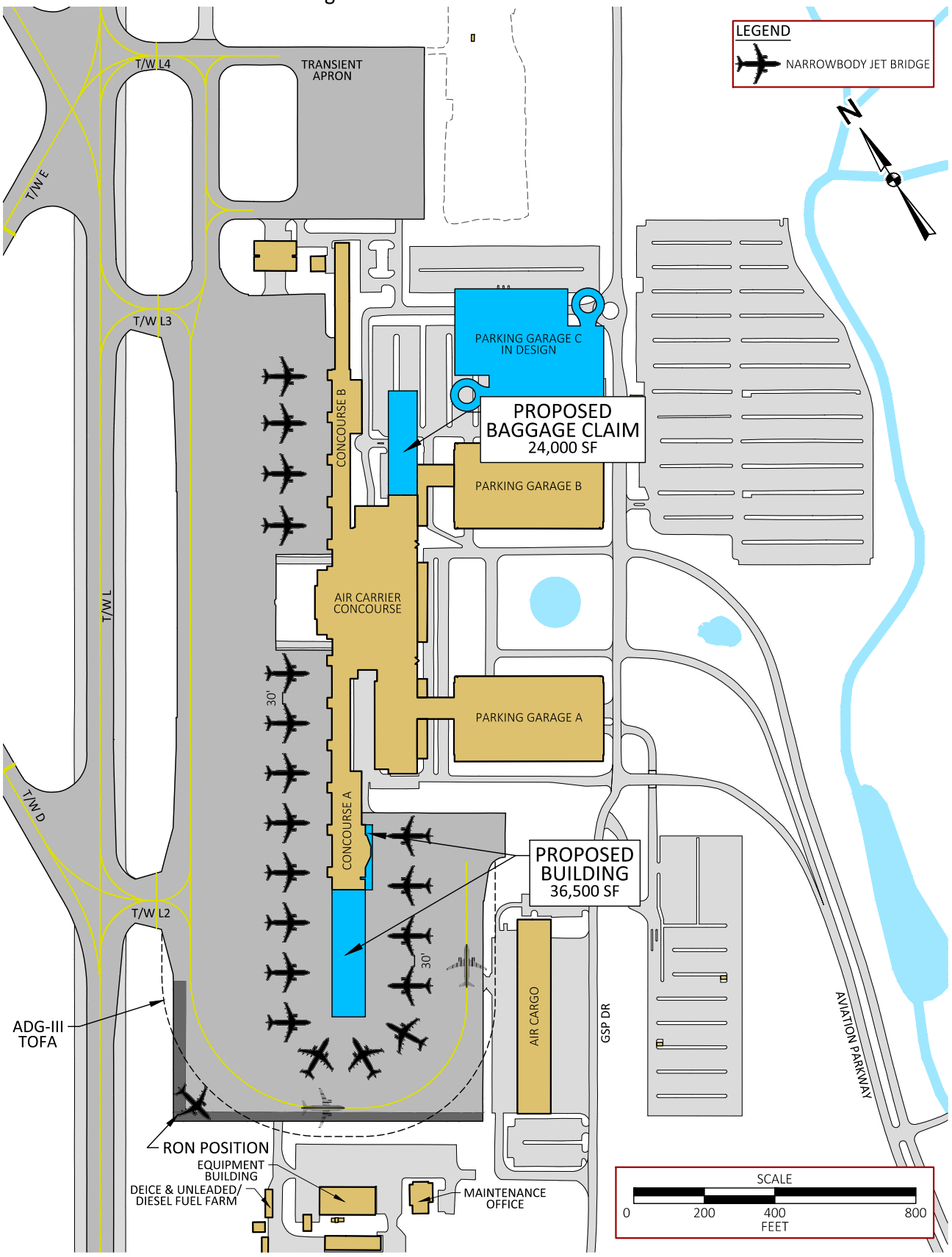
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-24: Terminal Alternative A1 - International



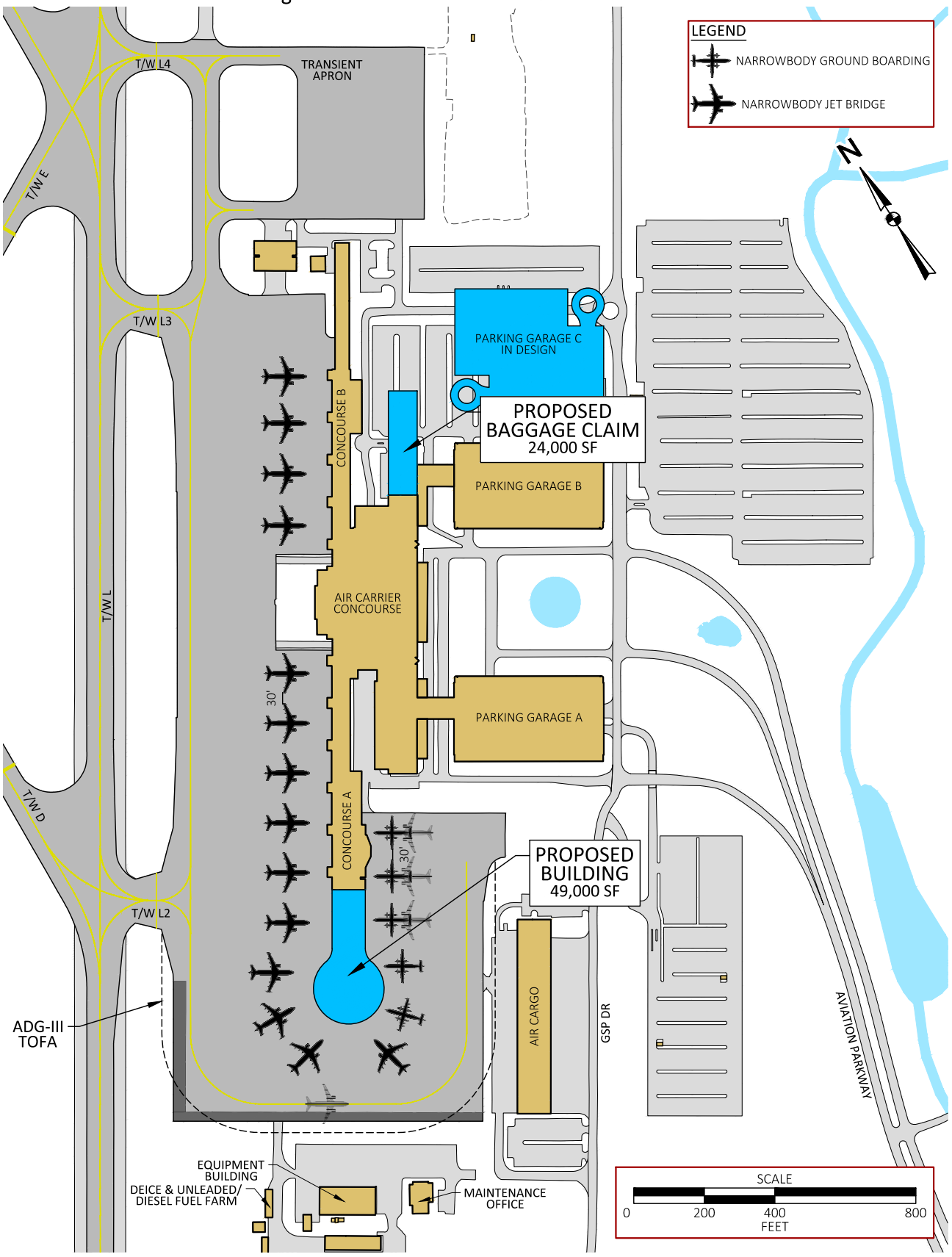
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-25: Terminal Alternative A2



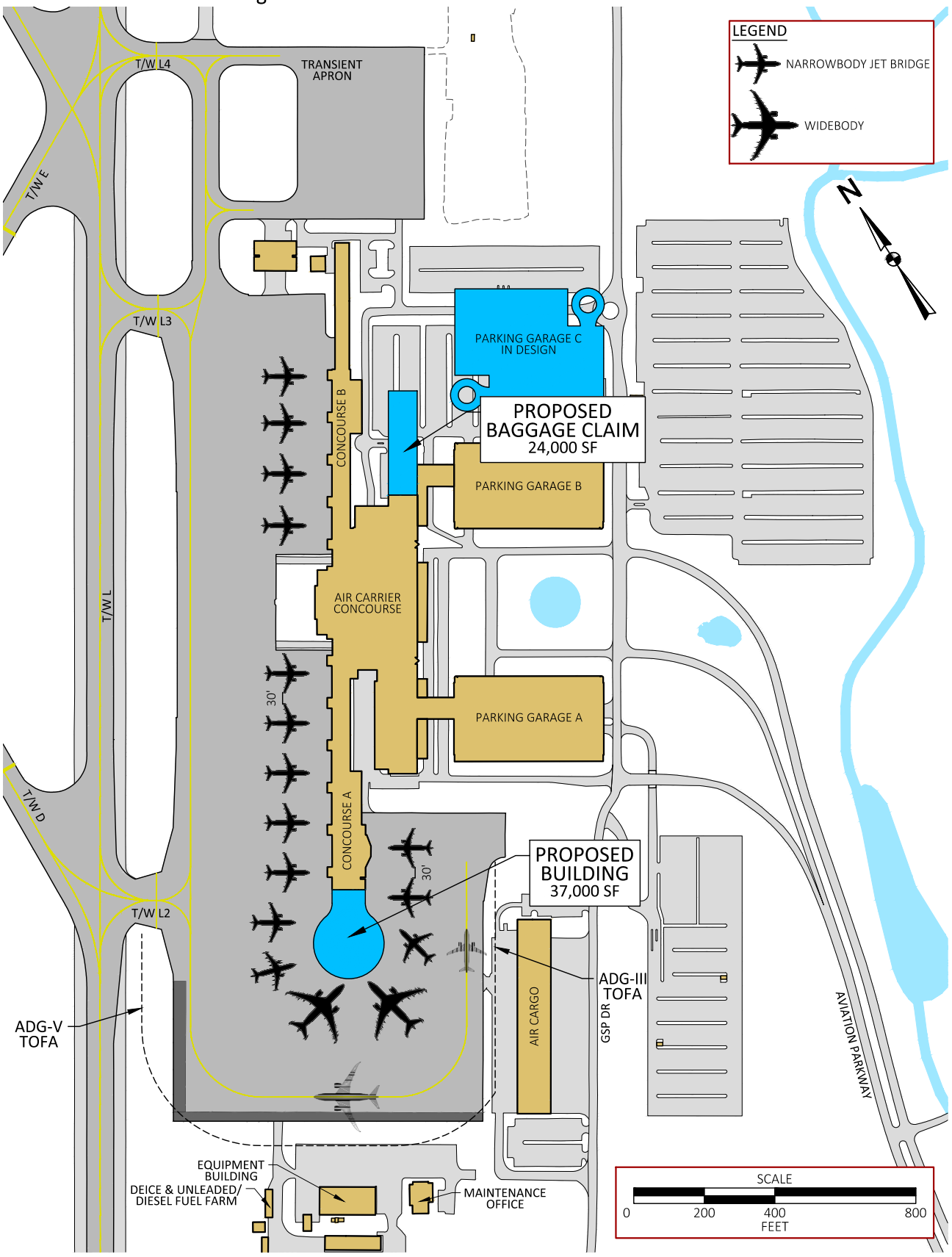
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-26: Terminal Alternative A3 - Ground



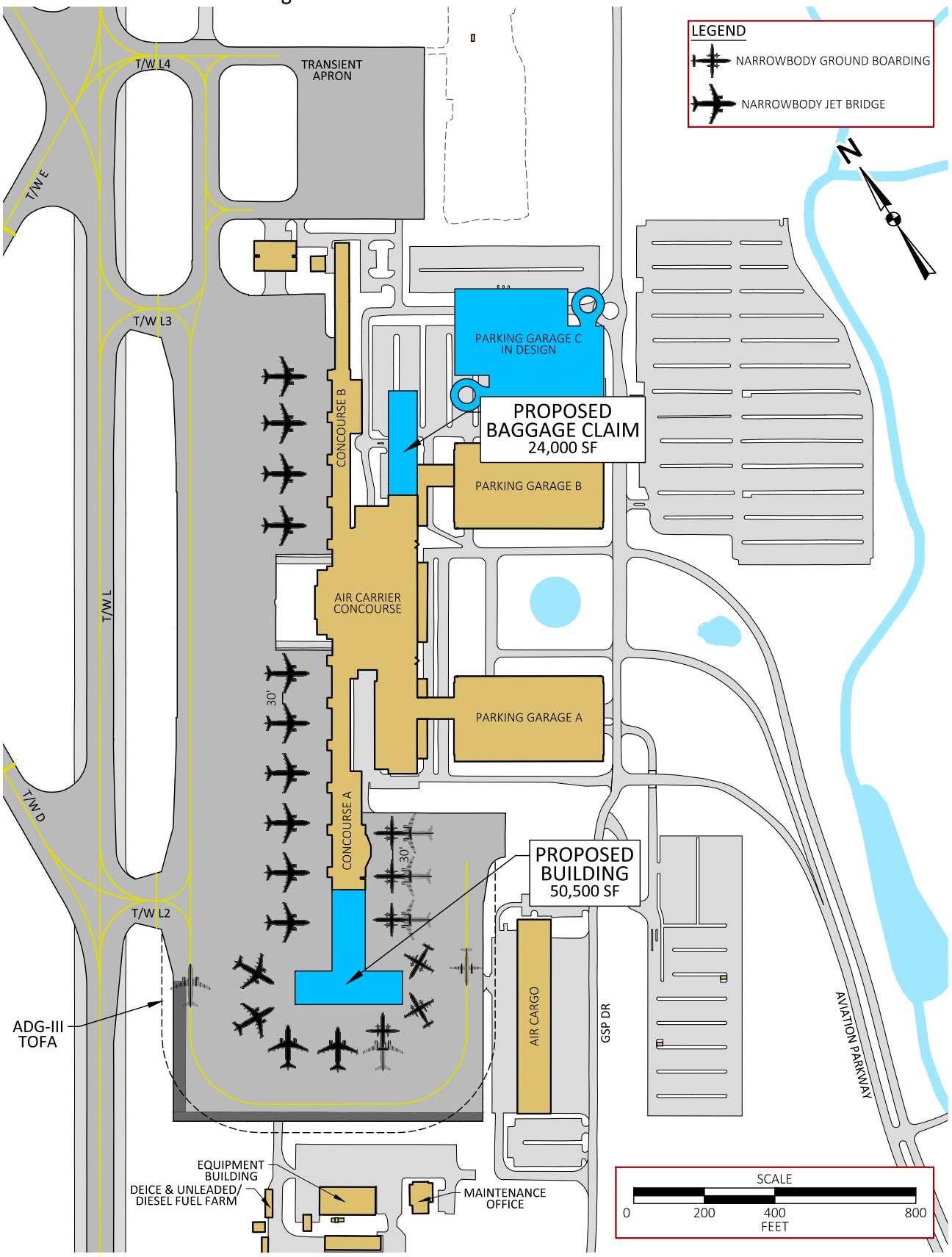
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-27: Terminal Alternative A3 - International



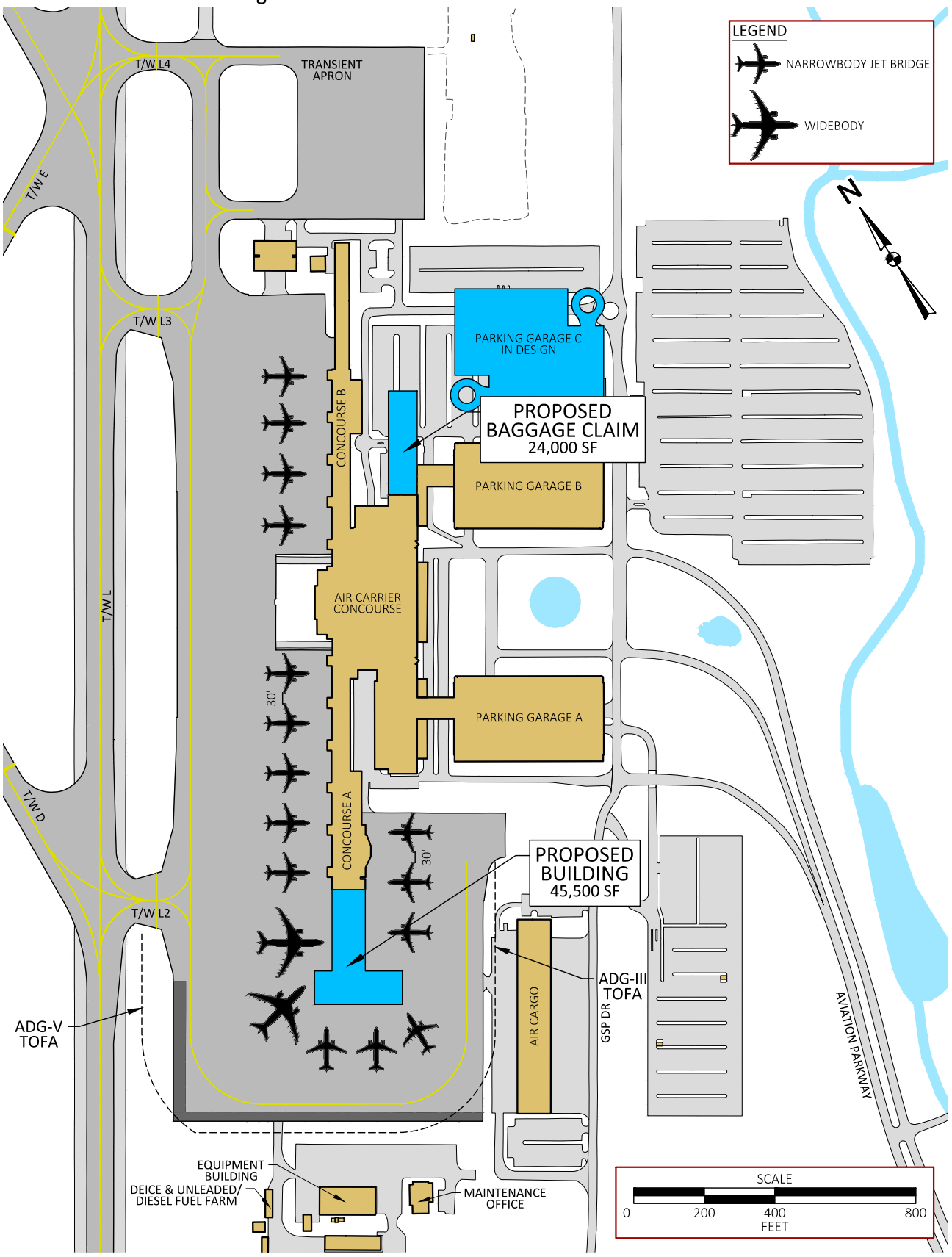
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-28: Terminal Alternative A4 - Ground



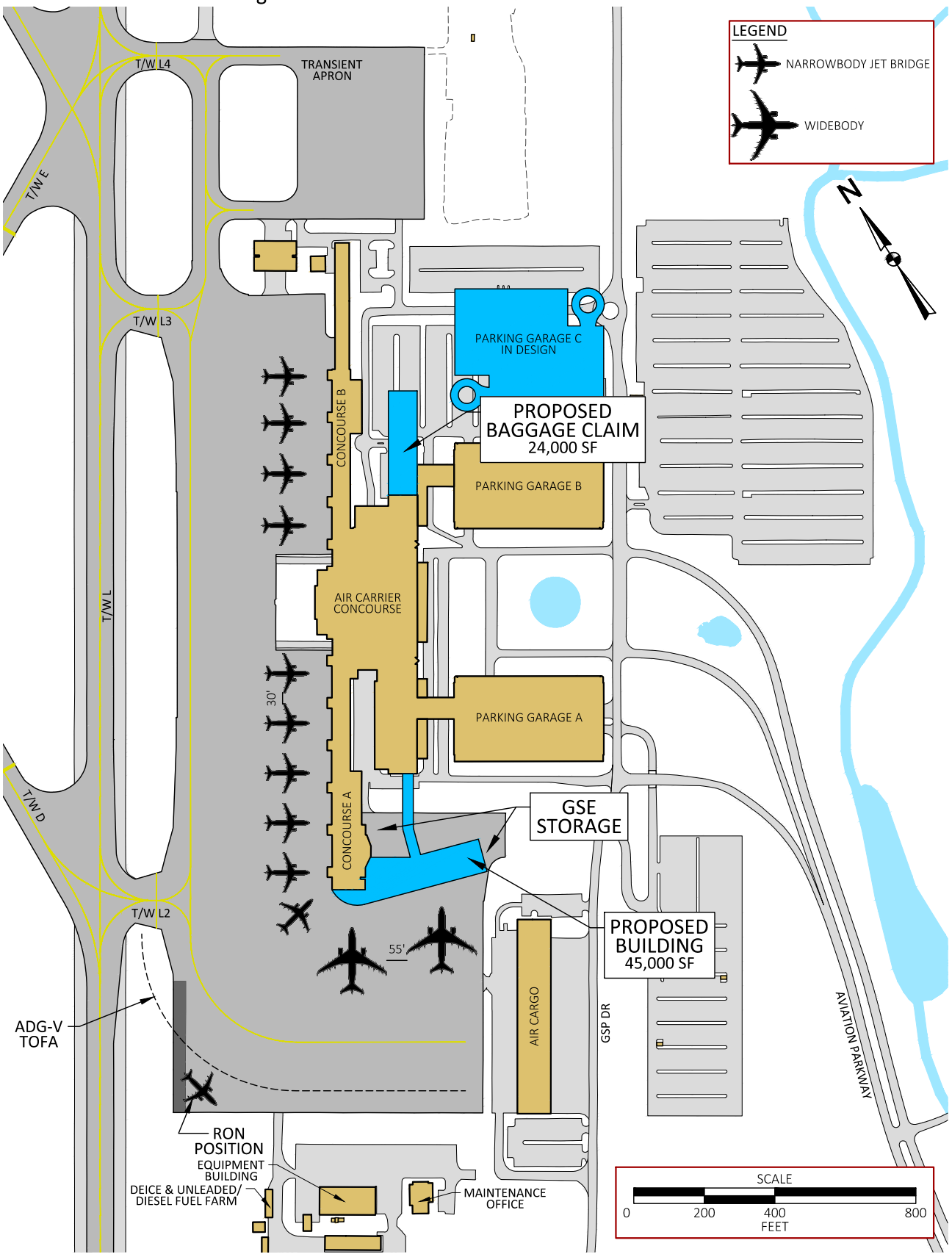
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-29: Terminal Alternative A4 - International



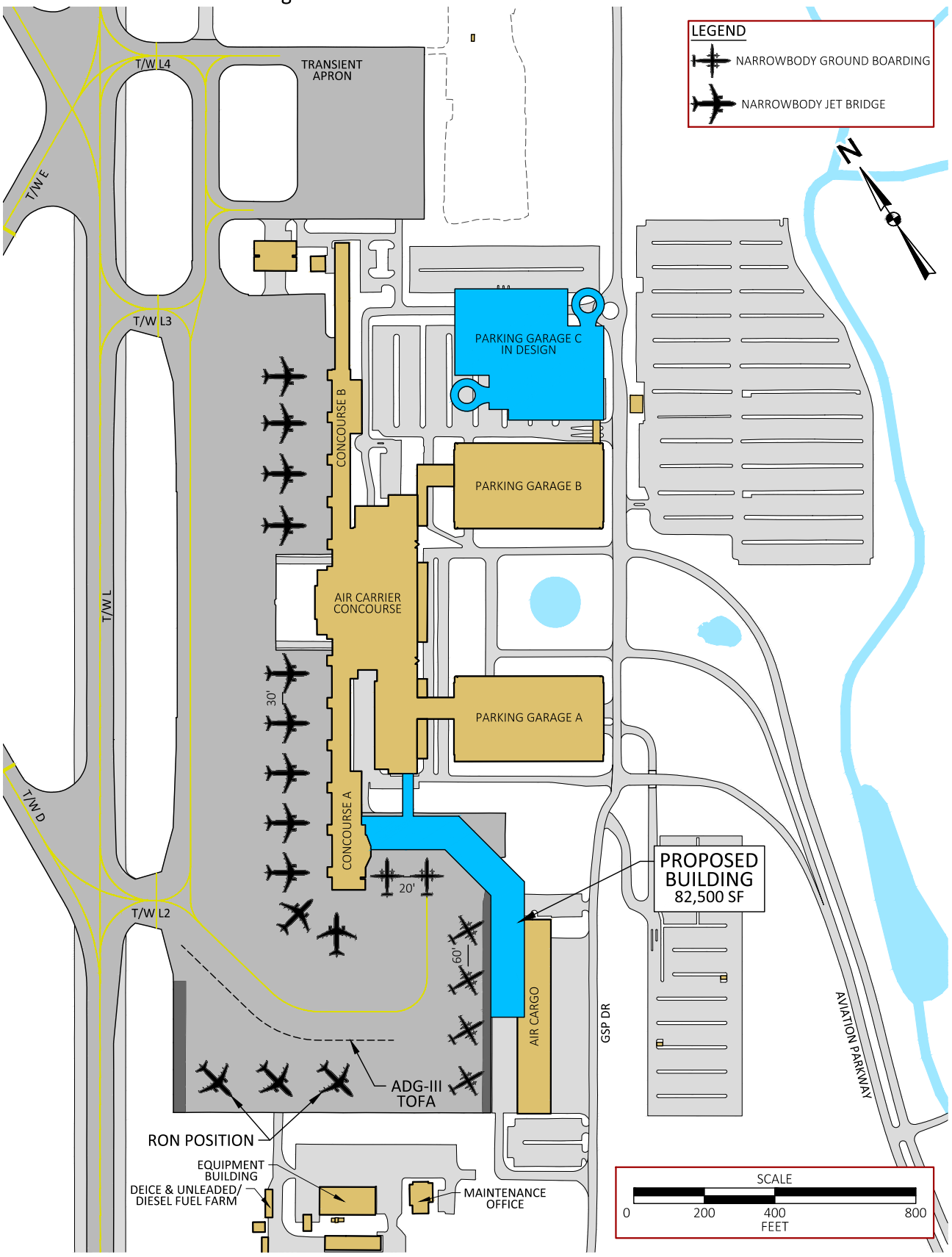
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-30: Terminal Alternative A5 - International



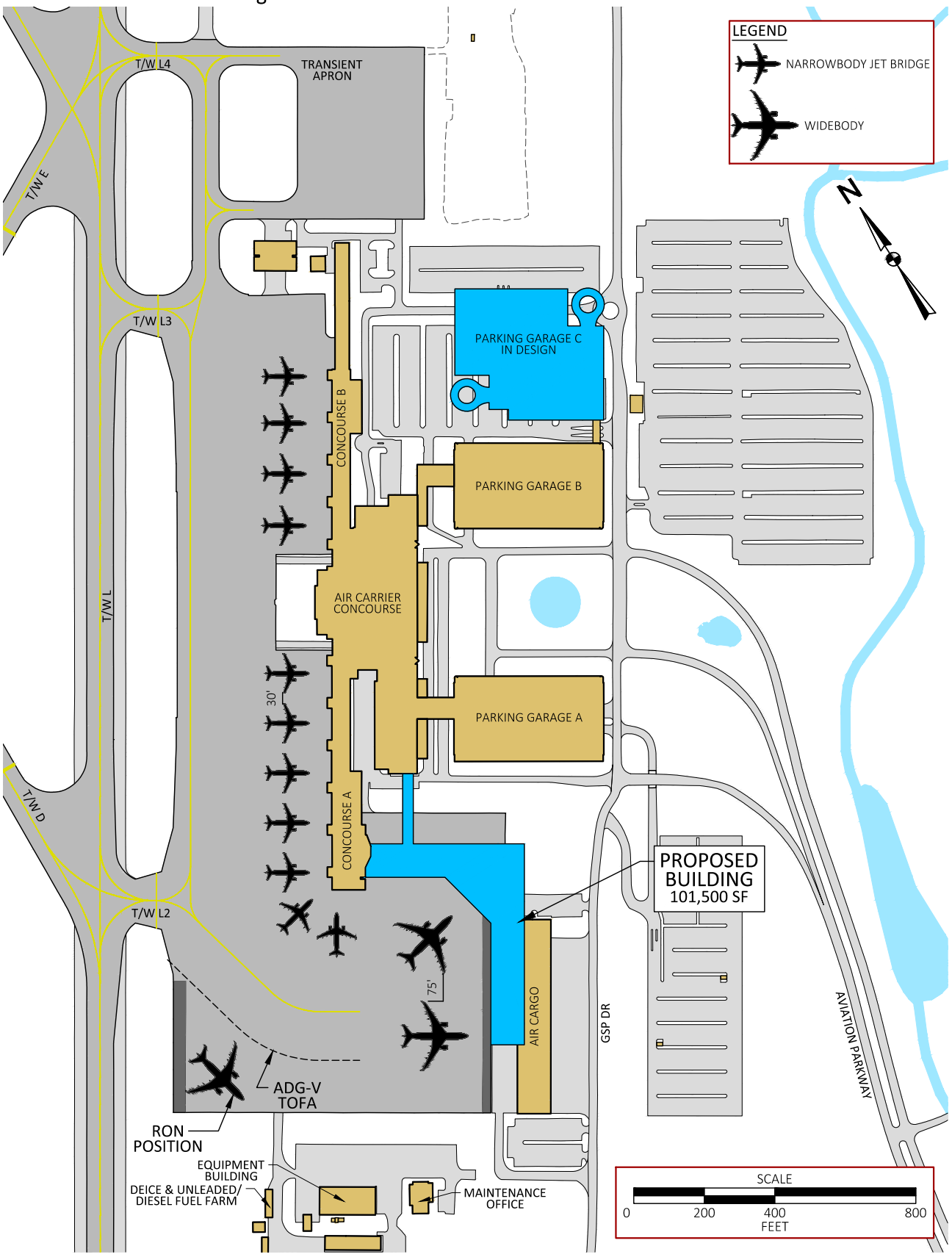
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-31: Terminal Alternative A6 - Ground



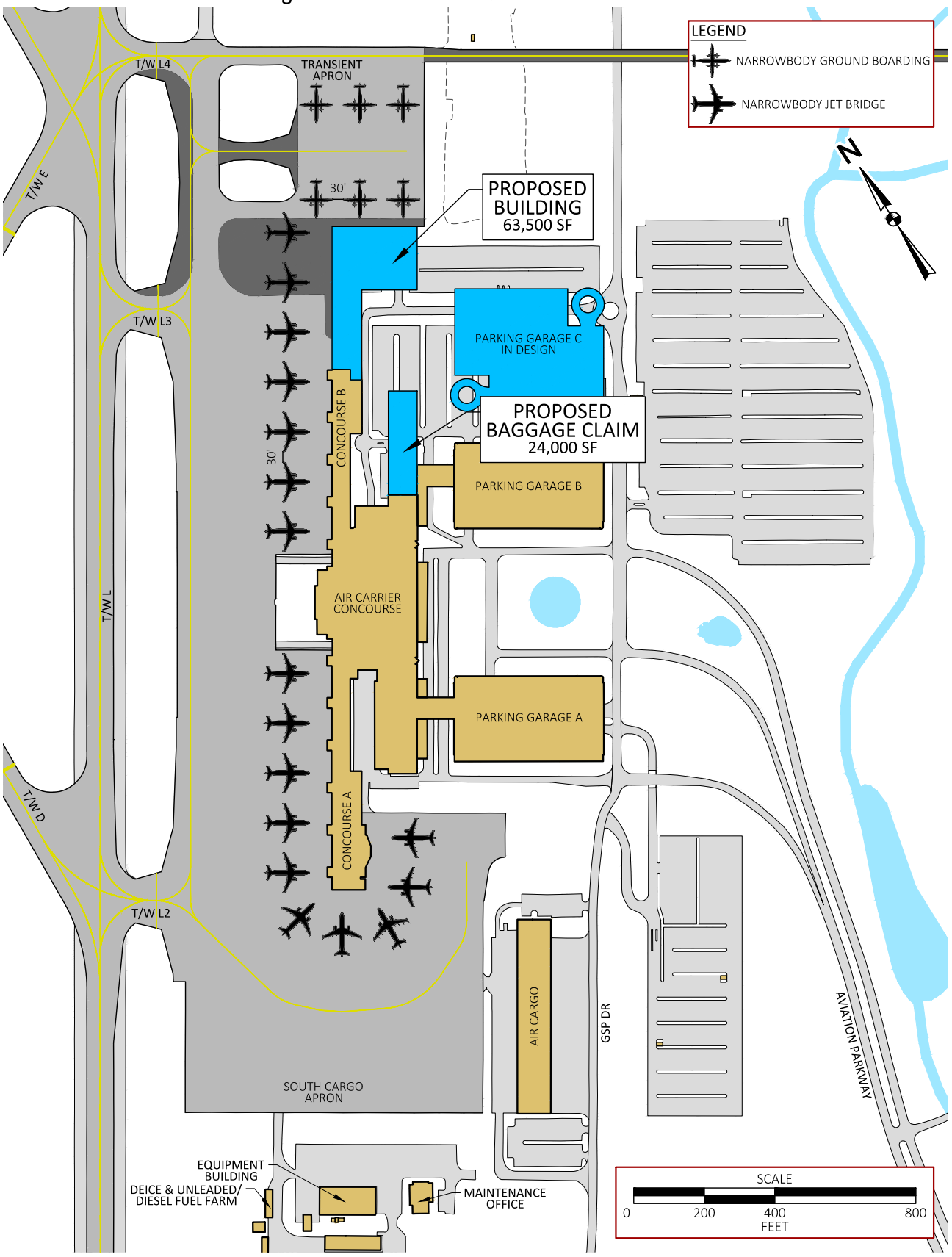
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-32: Terminal Alternative A6 - International



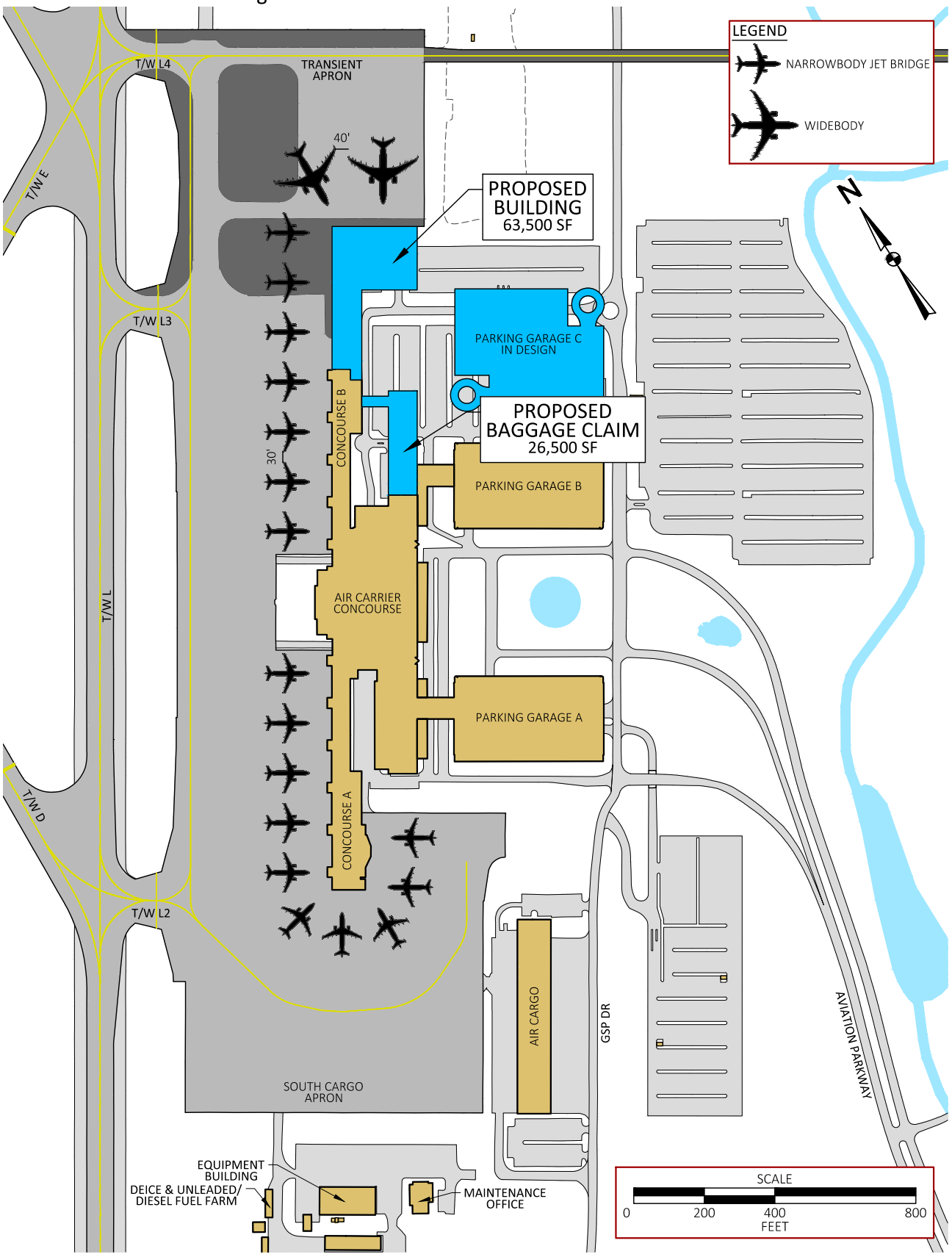
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-33: Terminal Alternative B1 - Ground



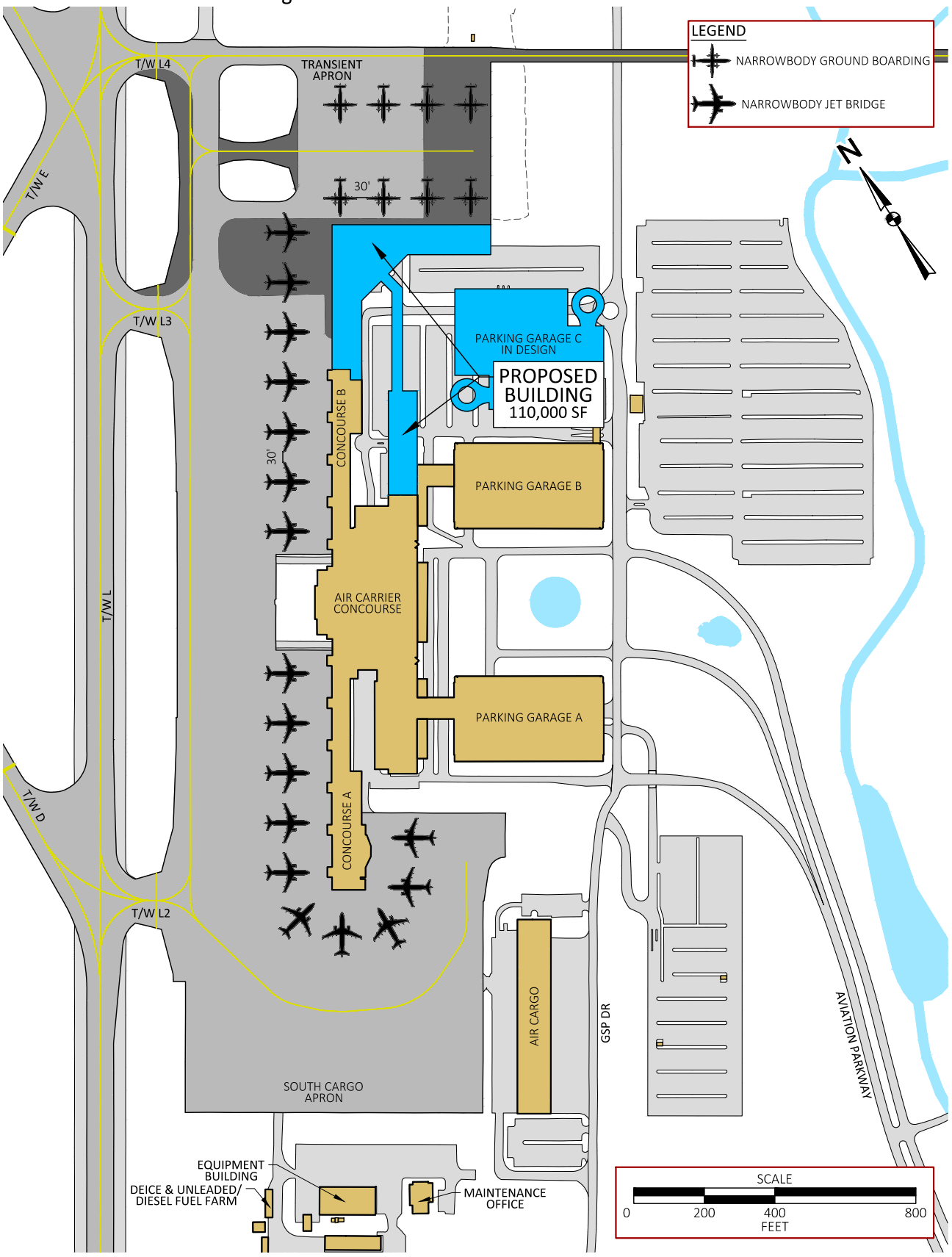
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-34: Terminal Alternative B1 - International



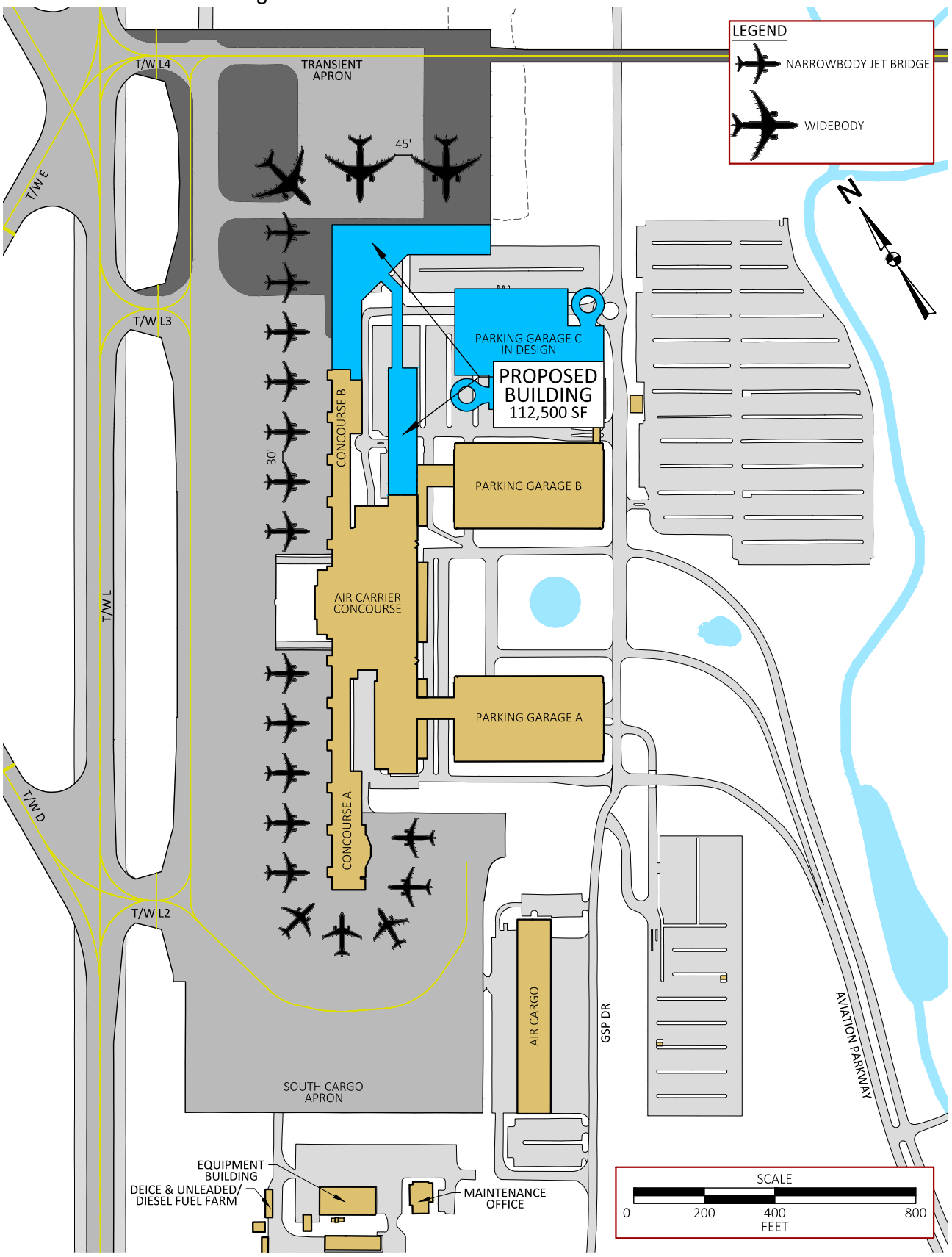
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-35: Terminal Alternative B2 - Ground



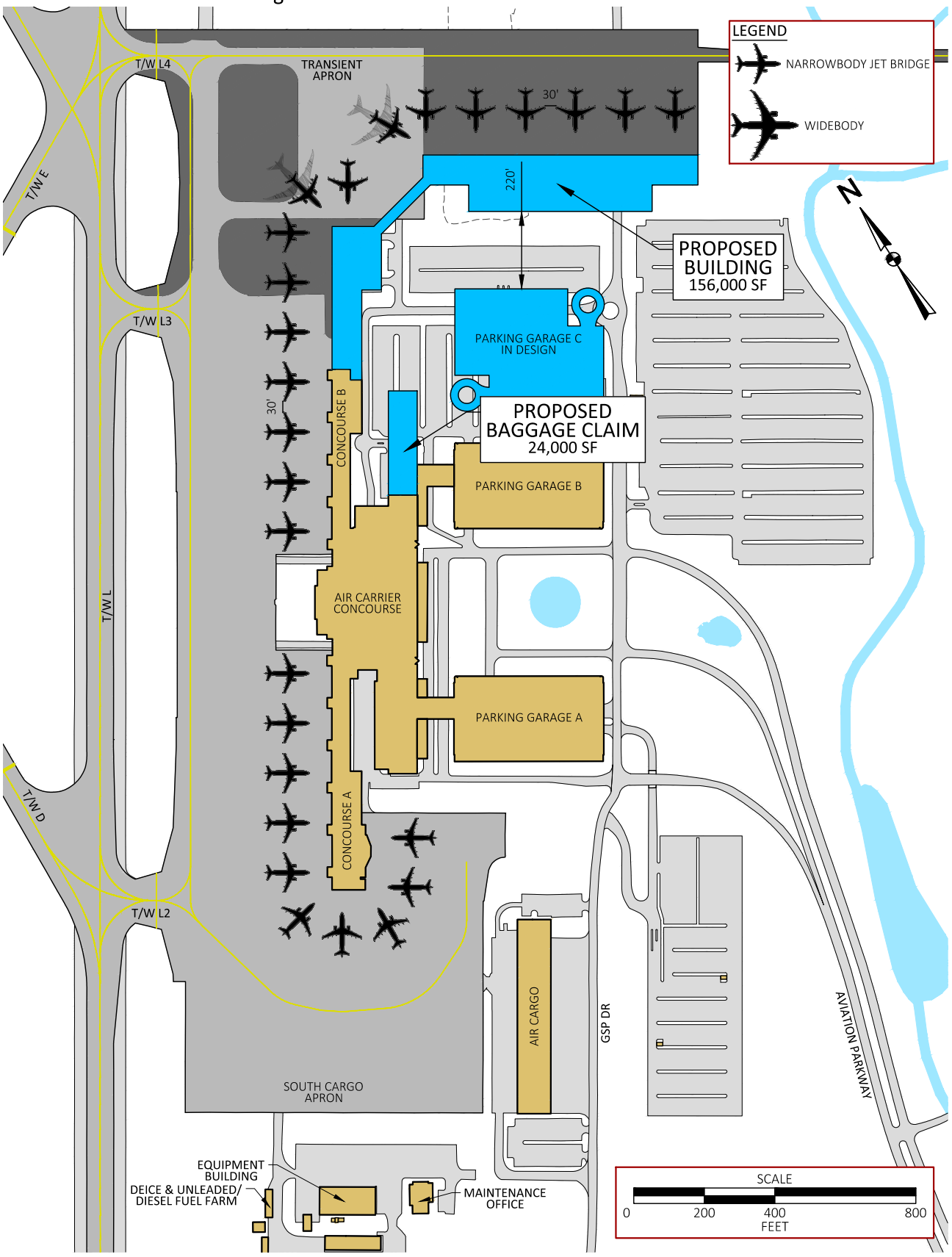
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-36: Terminal Alternative B2 - International



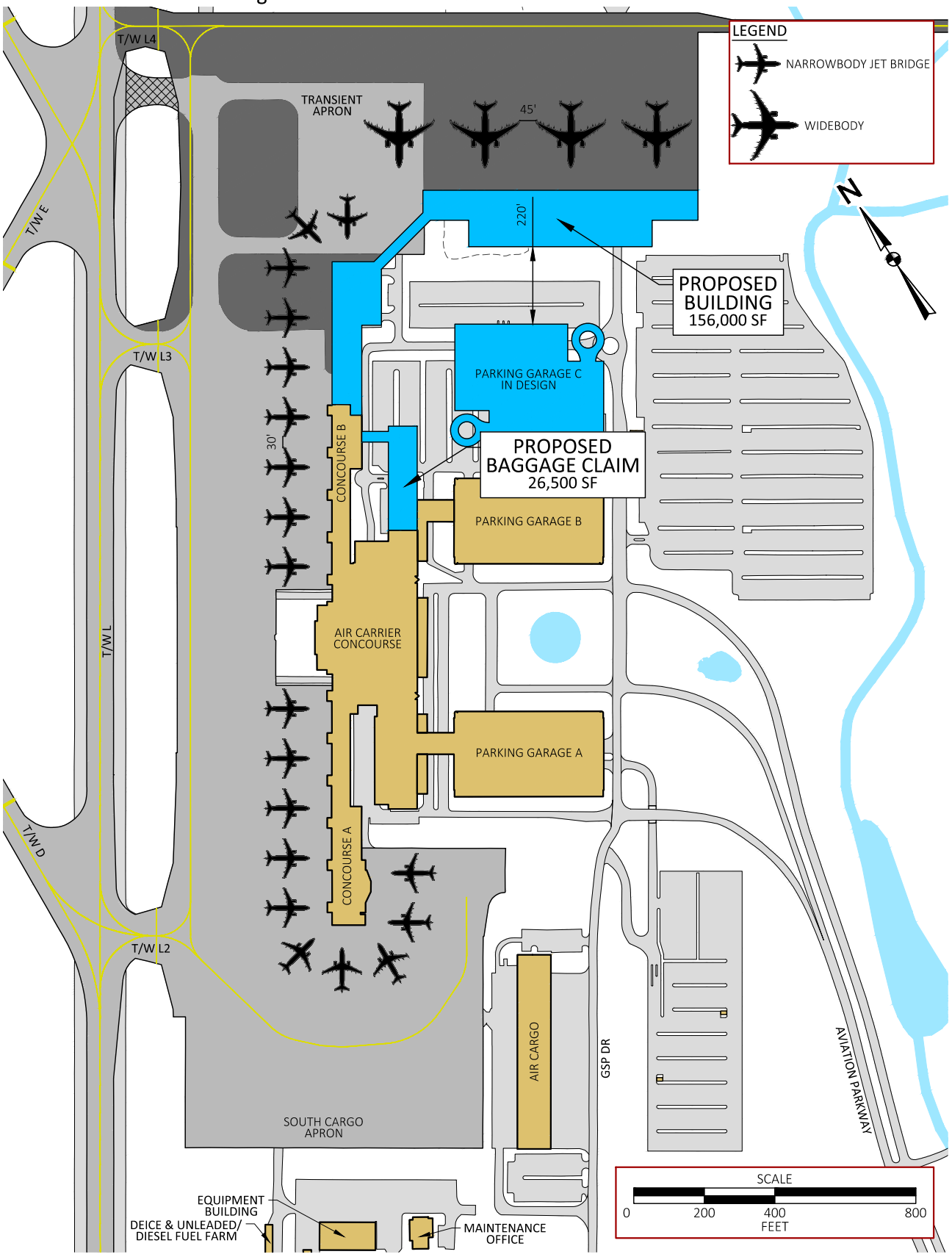
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-37: Terminal Alternative B3 - Domestic



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

Figure 6-38: Terminal Alternative B3 - International



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL.dwg

6.1.3. Landside Access and Parking Alternatives

Landside access alternatives were explored based on the findings of the roadway and circulation assessment and vehicular traffic analysis presented in Chapter 5, *Facility Requirements* and detailed in **Appendix B**. Landside access alternatives are broadly focused on three categories: 1) maintaining the existing roadway network to the greatest extent possible, 2) constructing an entirely new ingress and egress, and 3) separating GA access from Aviation Parkway to further segregate airport traffic utilizing the airport roadways.

In all alternatives, GSP Drive is proposed to be realigned and interchange with Aviation Parkway south and east of existing intersections of those roadways. This proposed interchanged is explored in both fly-over and multi-lane traffic circles in the presented alternatives. Where Aviation Parkway crosses sections of GSP Drive near Garage A and Garage B, these alternatives explore removing the intersection condition to allow for a continual flow of traffic and/or propose single-lane roundabouts to permit continuous traffic flow. No alternative presents full-stop intersections when exploring improvements to the Airport's internal roadways. Additional considerations that supplemented the development of landside alternatives are discussed below.

- **Level of Service (LOS) at 3.5 MAEP:** The landside alternatives were developed with the considerations to achieve a LOS for landside access of A or B at 3.5 MAEP.

- **Inhibit Cut-Through Traffic:** Considerations to reduce the amount of non-airport related traffic using landside access roadways was included in the development of the landside alternatives. The majority of this cut through traffic uses GSP Drive, one of the Airport's main internal roadways, to traverse Airport property. To address this, each alternative shows the ultimate deactivation of Stevens Road, a small but vital roadway allowing for significant through traffic.

- **Segregate Traffic:** The landside alternatives seek to segregate traffic by type and destination. Considerations to segregate traffic accessing parking, terminal curbside, and GA facilities were included in the development of these alternatives.

- **Maintain Campus Aesthetic:** Considerations for the visual appeal of the existing roadway network and the Airport's desire to maintain aesthetics were included in the development of these alternatives.

- **Additional Parking Capacity:** All landside access alternatives depict parking layouts which are compatible with the proposed access roadways. The additional lots shown are required to meet the parking demand for the planning period. A third parking garage (Parking Garage C) is under design adjacent to Parking Garage B, where the existing daily parking lot is. Accommodating this facility and increased passenger demand throughout the planning period will require an increase in surface lot capacity. Additionally, the employee lot will be relocated and is expected to require at least 400 spaces. These parking capacity requirements were included in the development of landside alternatives.

Table 6-3 identifies each of the initial landside access alternatives developed. **Figure 6-39** to **Figure 6-51** depict the initial landside access alternatives developed. The groupings of each set of landside

access alternatives are described below with the resulting details shown in respective figures. Further discussion of the alternatives selected for further refinement included in Section 6.2.2.

- **Existing Roads and GA Access:** This set of alternatives maintains the majority of the existing access to the Airport on Aviation Parkway and provides access to and from GA facilities. These alternatives show variations in the use of a two-lane roundabout compared to fly-over exit/entrance ramps to and from Aviation Parkway. In addition, the segregation of traffic approaching the terminal curb lane and accessing parking facilities varies among this set of alternatives.

- **New Approach and GA Access:** This set of alternatives proposes a new approach to the Airport by reconfiguring Aviation Parkway. These alternatives also provide access to and from GA facilities. These alternatives show variations in the use of a two-lane roundabout compared to fly-over exit/entrance ramps to and from Aviation Parkway. In addition, the segregation of traffic approaching the terminal curb lane and accessing parking facilities varies among this set of alternatives.

- **New Approach and No GA Access:** This set of alternatives proposes a new access to the Airport by reconfiguring Aviation Parkway. These alternatives do not provide access to or from GA facilities. These alternatives show variations in the use of a two-lane roundabout compared to fly-over exit/entrance ramps to and from Aviation Parkway. In addition, the segregation of traffic approaching the terminal curb lane and accessing parking facilities varies among this set of alternatives.

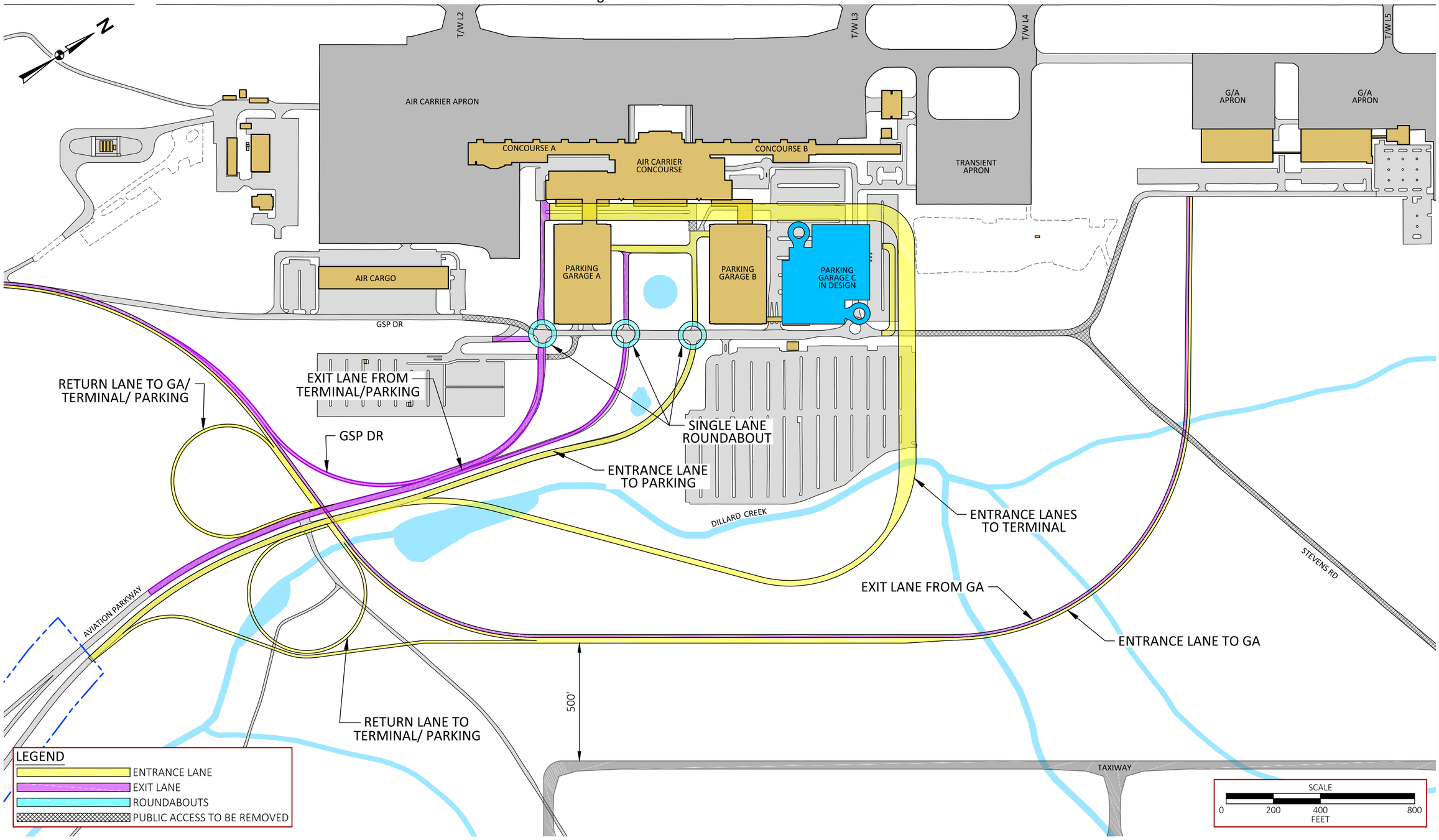
Table 6-3: Identified Landside Access Alternatives

Focus	Initial Alternatives	Figure
Existing Roads and GA	Landside Access Alternative 1A	Figure 6-39
	Landside Access Alternative 1B	Figure 6-40
	Landside Access Alternative 1C	Figure 6-41
	Landside Access Alternative 1D	Figure 6-42
	Landside Access Alternative 1E	Figure 6-43
New Approach and GA	Landside Access Alternative 2A	Figure 6-44
	Landside Access Alternative 2B	Figure 6-45
	Landside Access Alternative 2C	Figure 6-46
	Landside Access Alternative 2D	Figure 6-47
No GA Access	Landside Access Alternative 3A	Figure 6-48
	Landside Access Alternative 3B	Figure 6-49
	Landside Access Alternative 3C	Figure 6-50
	Landside Access Alternative 3D	Figure 6-51

Source: McFarland Johnson, 2018

This page has been intentionally left blank.

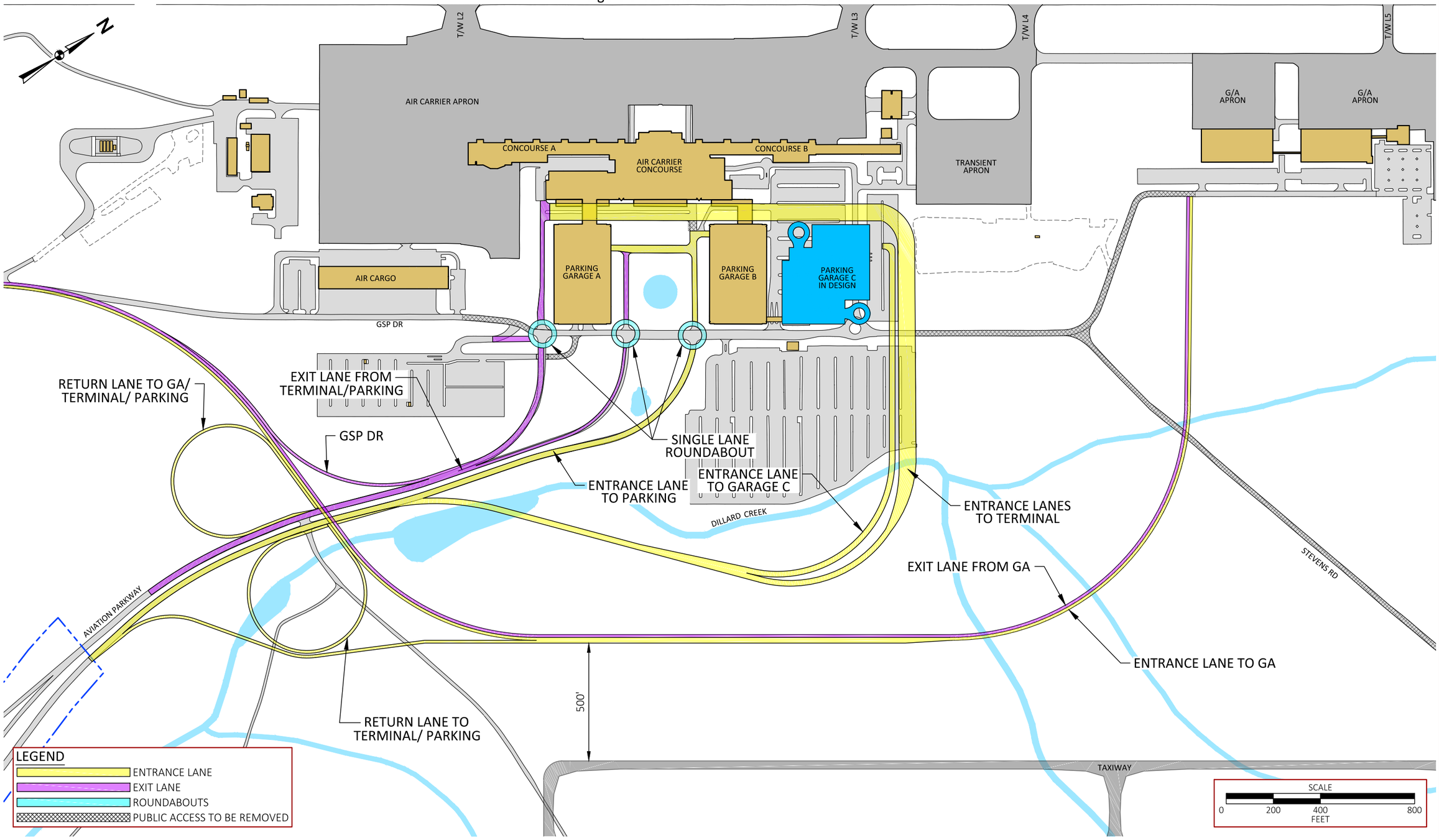
Figure 6-39: Landside Access Alternative 1A



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4A.dwg

This page has been intentionally left blank.

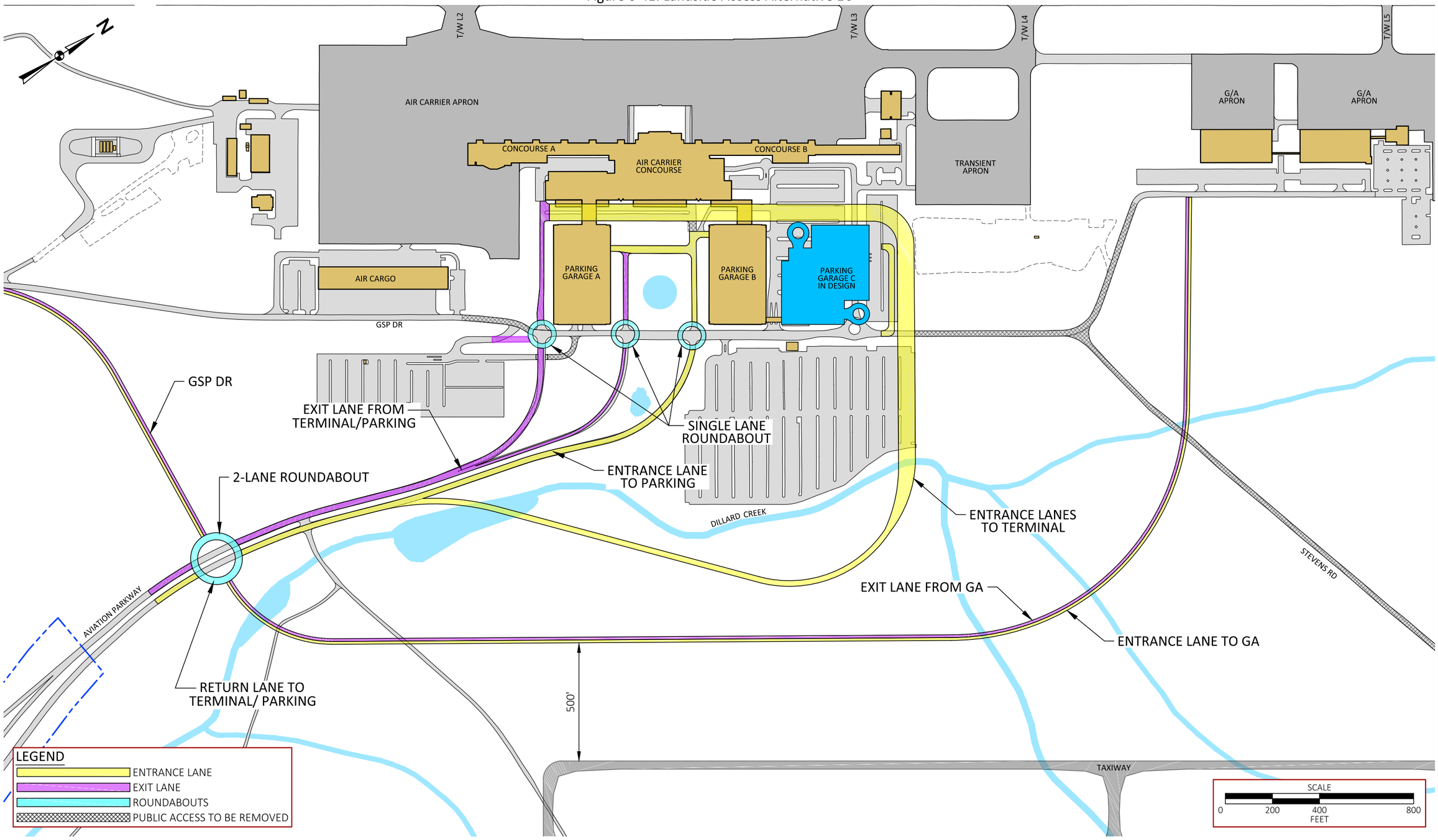
Figure 6-40: Landside Access Alternative 1B



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4A-3.dwg

This page has been intentionally left blank.

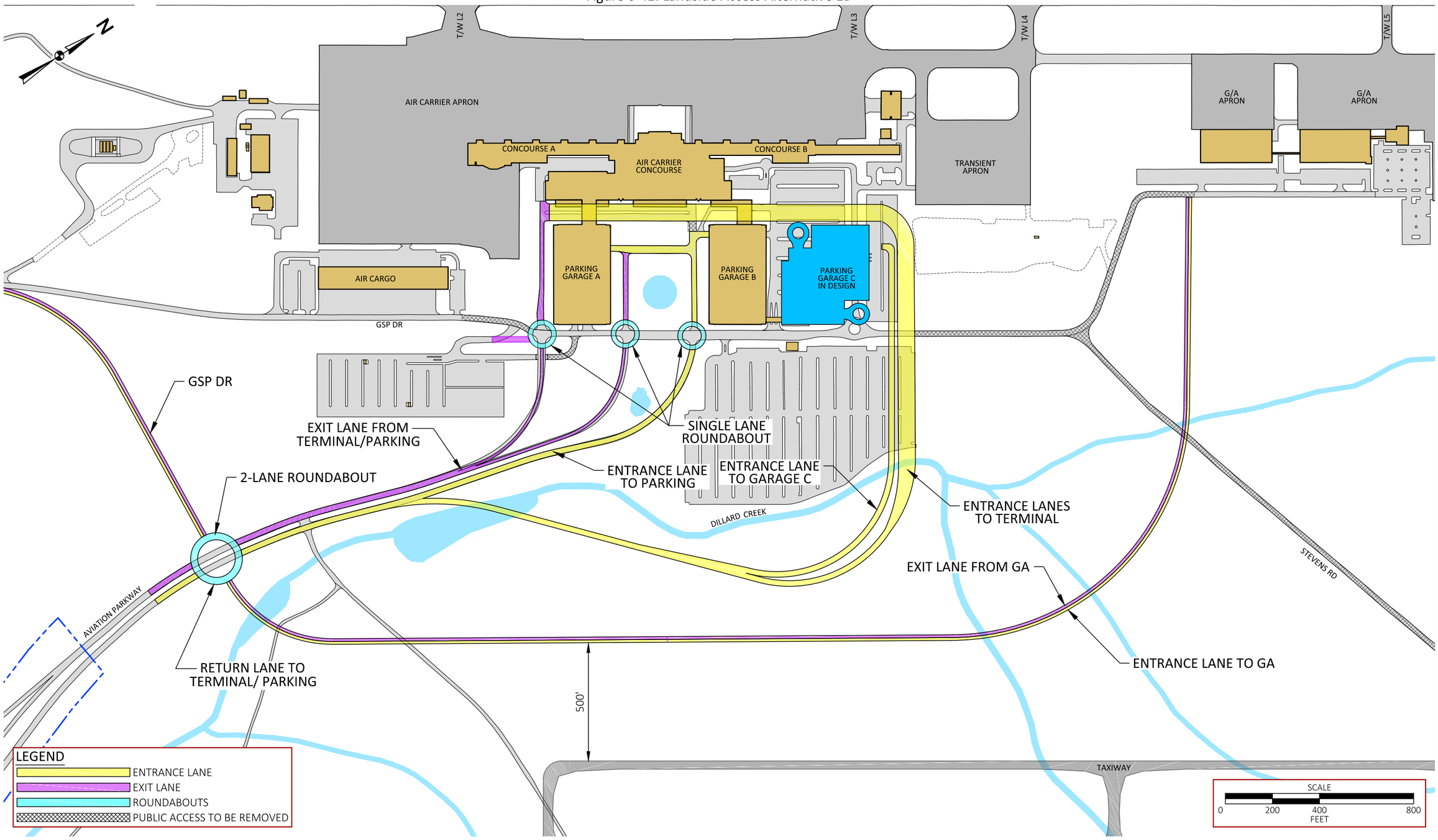
Figure 6-41: Landside Access Alternative 1C



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4A-2.dwg

This page has been intentionally left blank.

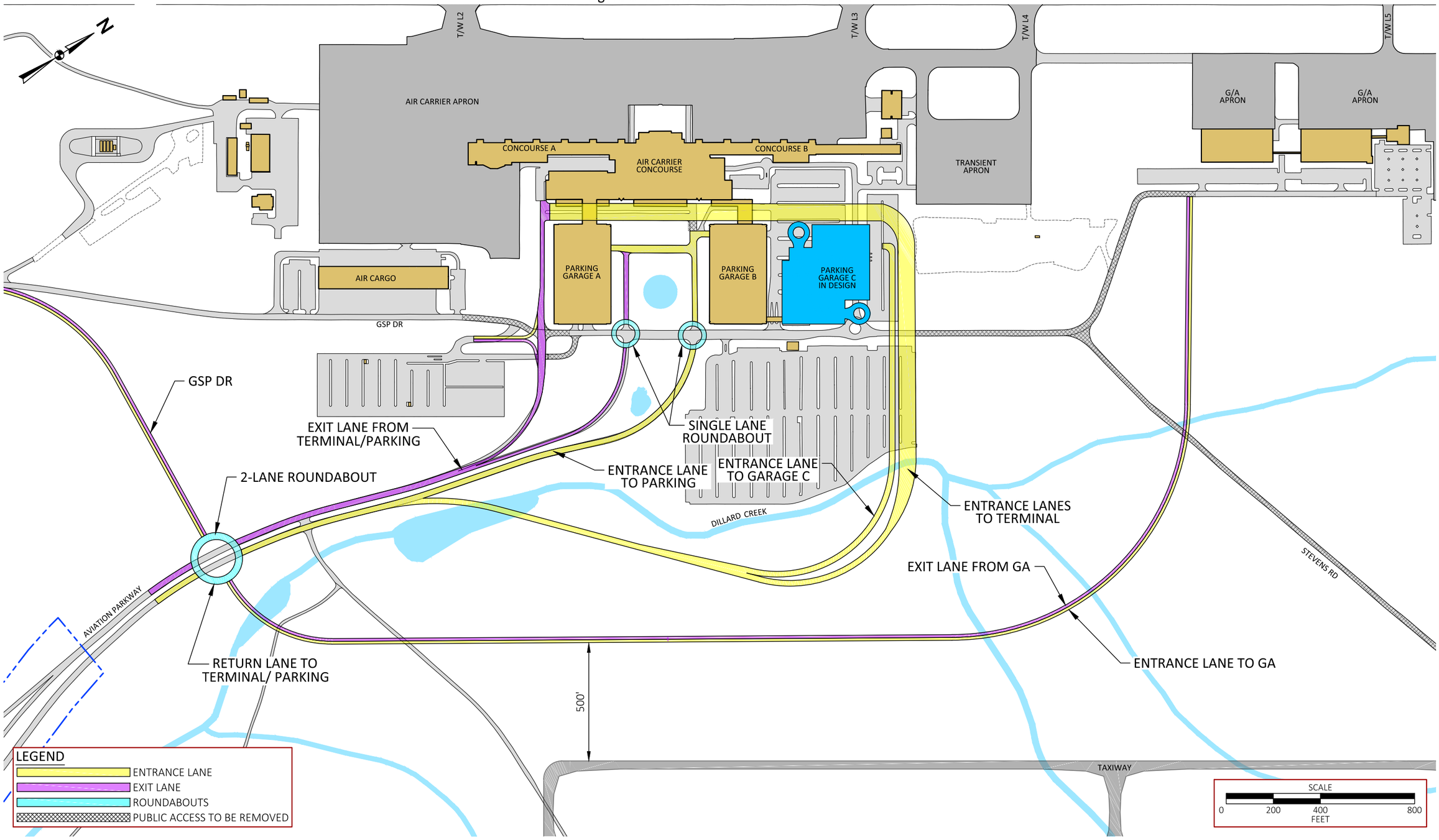
Figure 6-42: Landside Access Alternative 1D



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4A-ROUNDABOUT.dwg

This page has been intentionally left blank.

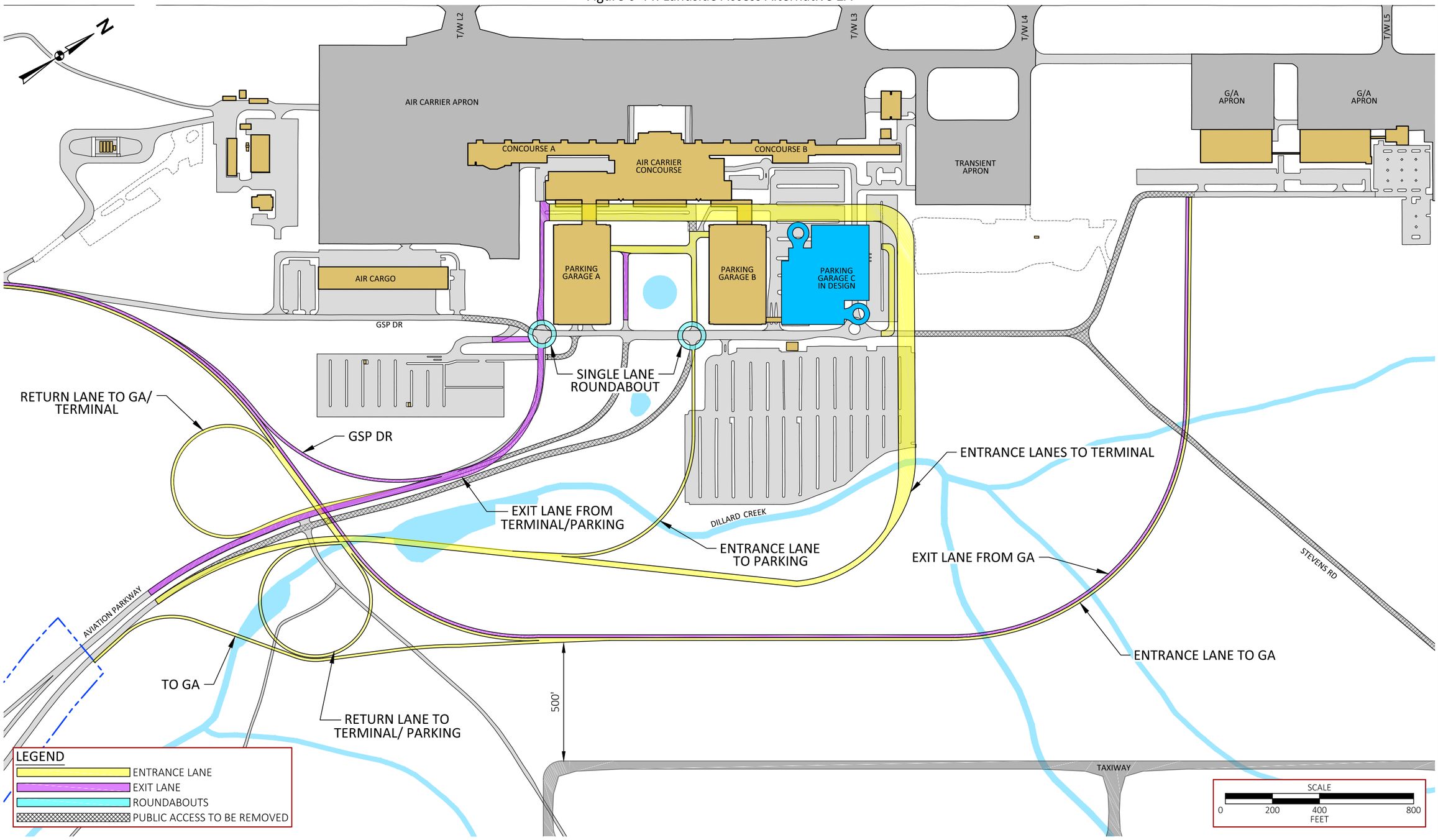
Figure 6-43: Landside Access Alternative 1E



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4A-5.dwg

This page has been intentionally left blank.

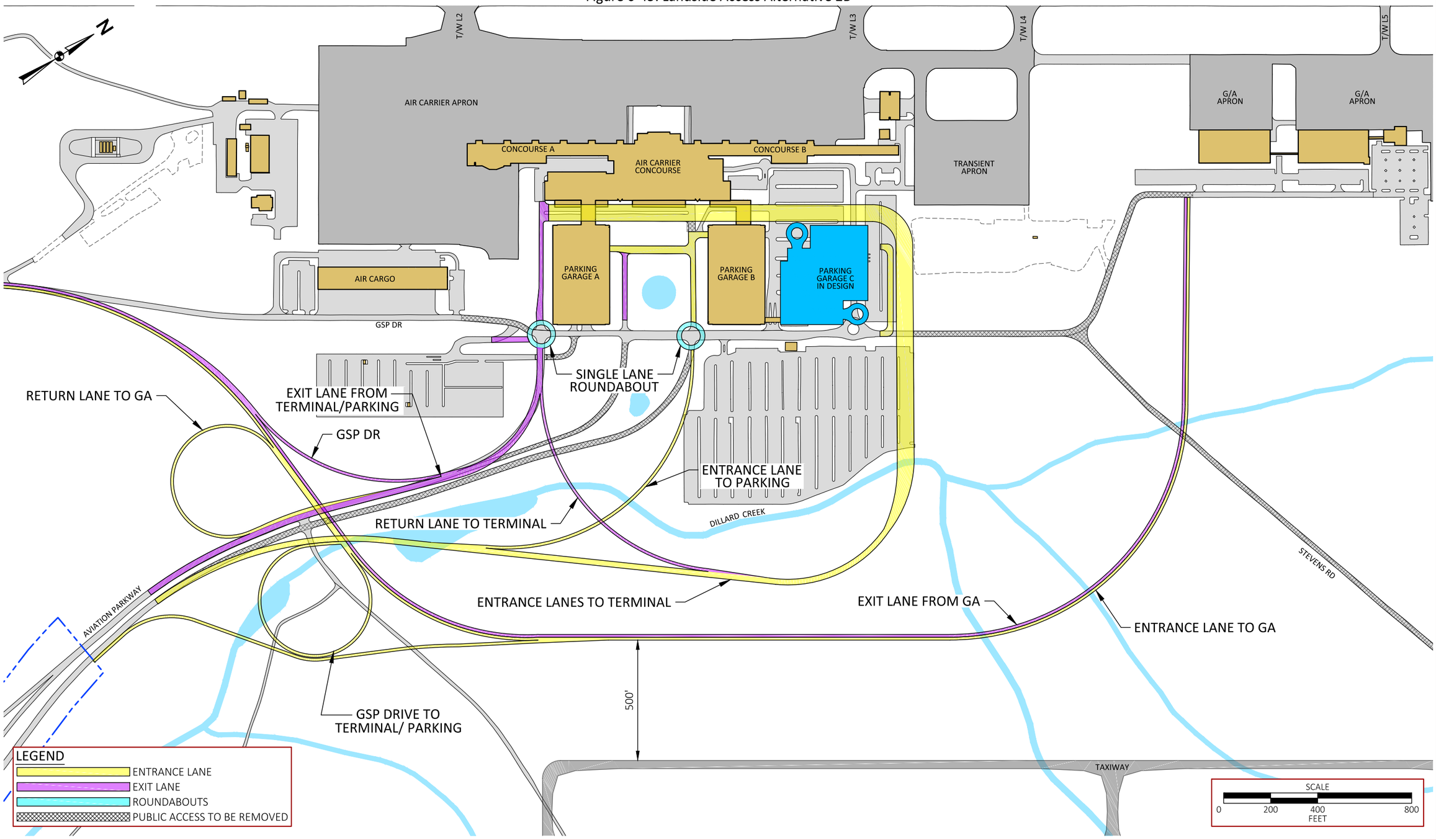
Figure 6-44: Landside Access Alternative 2A



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4B1.dwg

This page has been intentionally left blank.

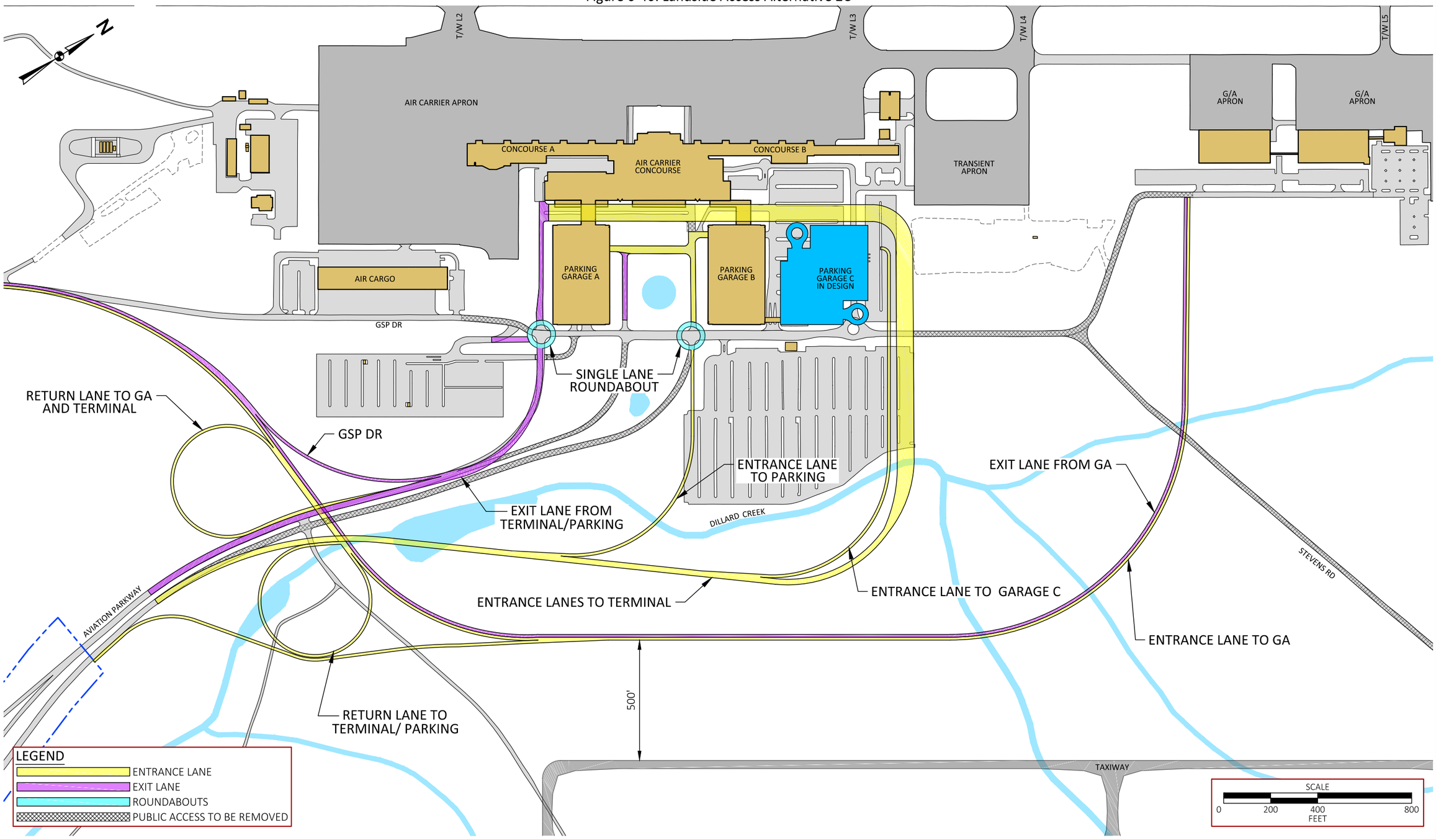
Figure 6-45: Landside Access Alternative 2B



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4B-2.dwg

This page has been intentionally left blank.

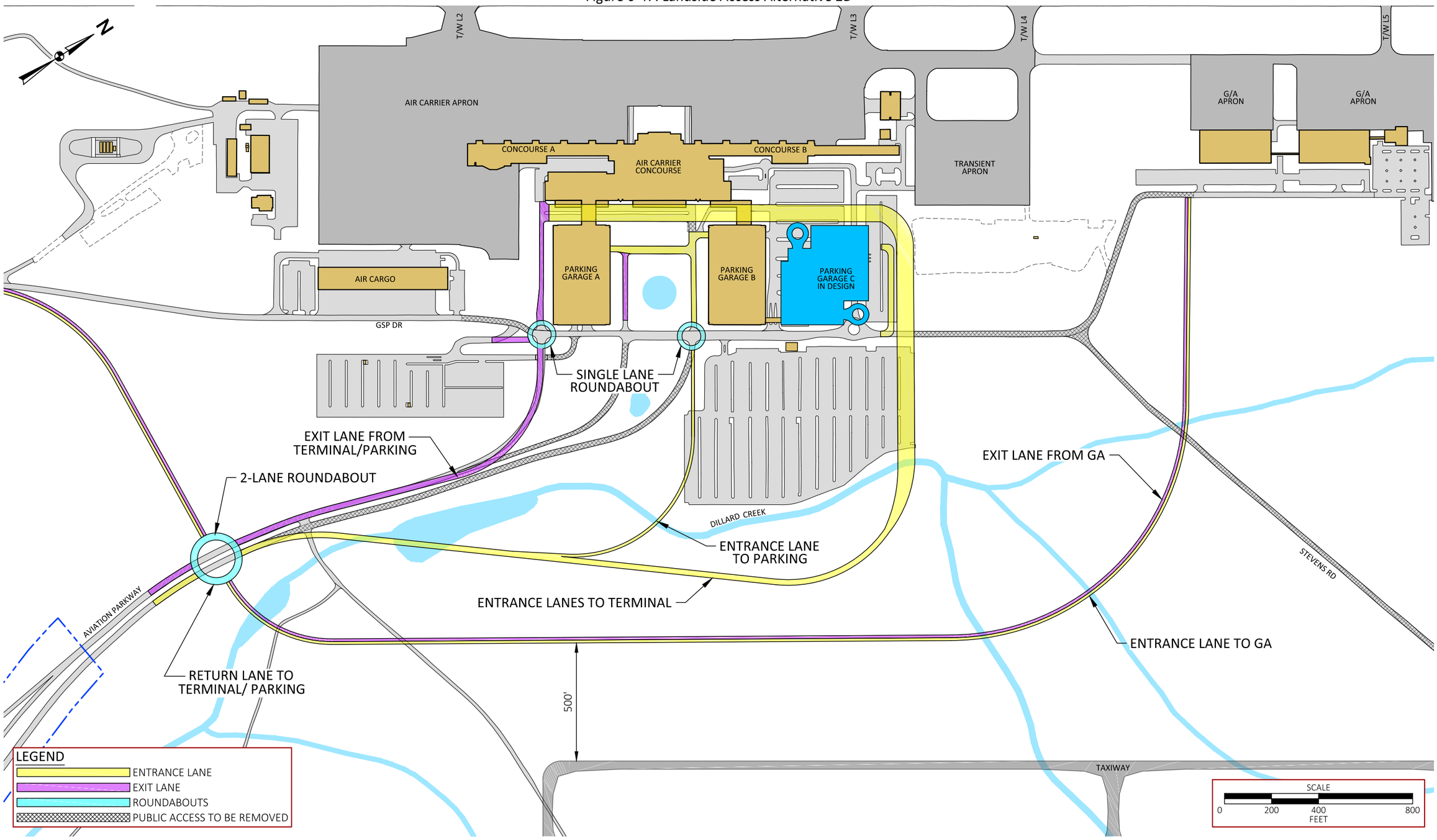
Figure 6-46: Landside Access Alternative 2C



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4B-3.dwg

This page has been intentionally left blank.

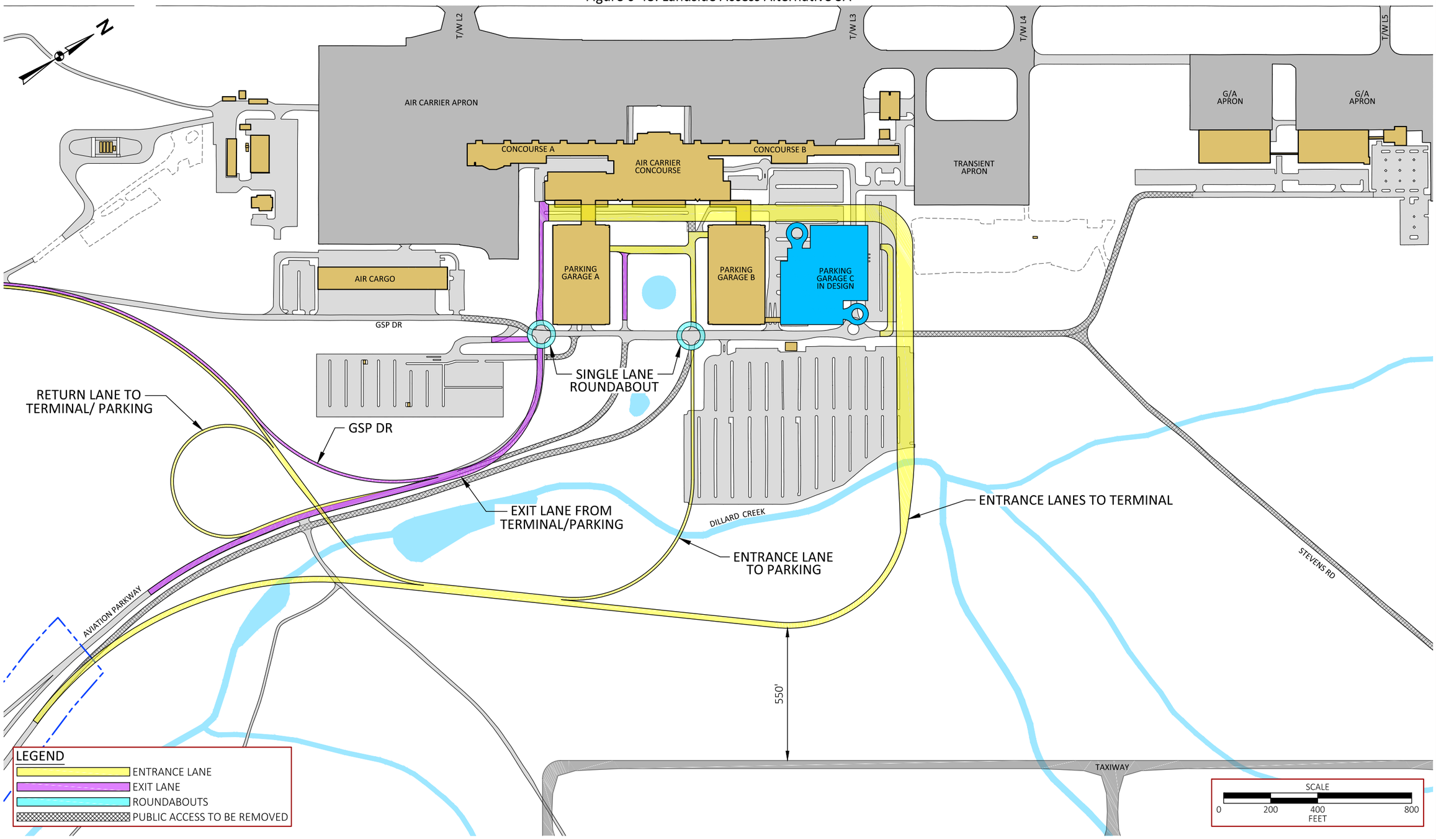
Figure 6-47: Landside Access Alternative 2D



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4B-ROUNDABOUT.dwg

This page has been intentionally left blank.

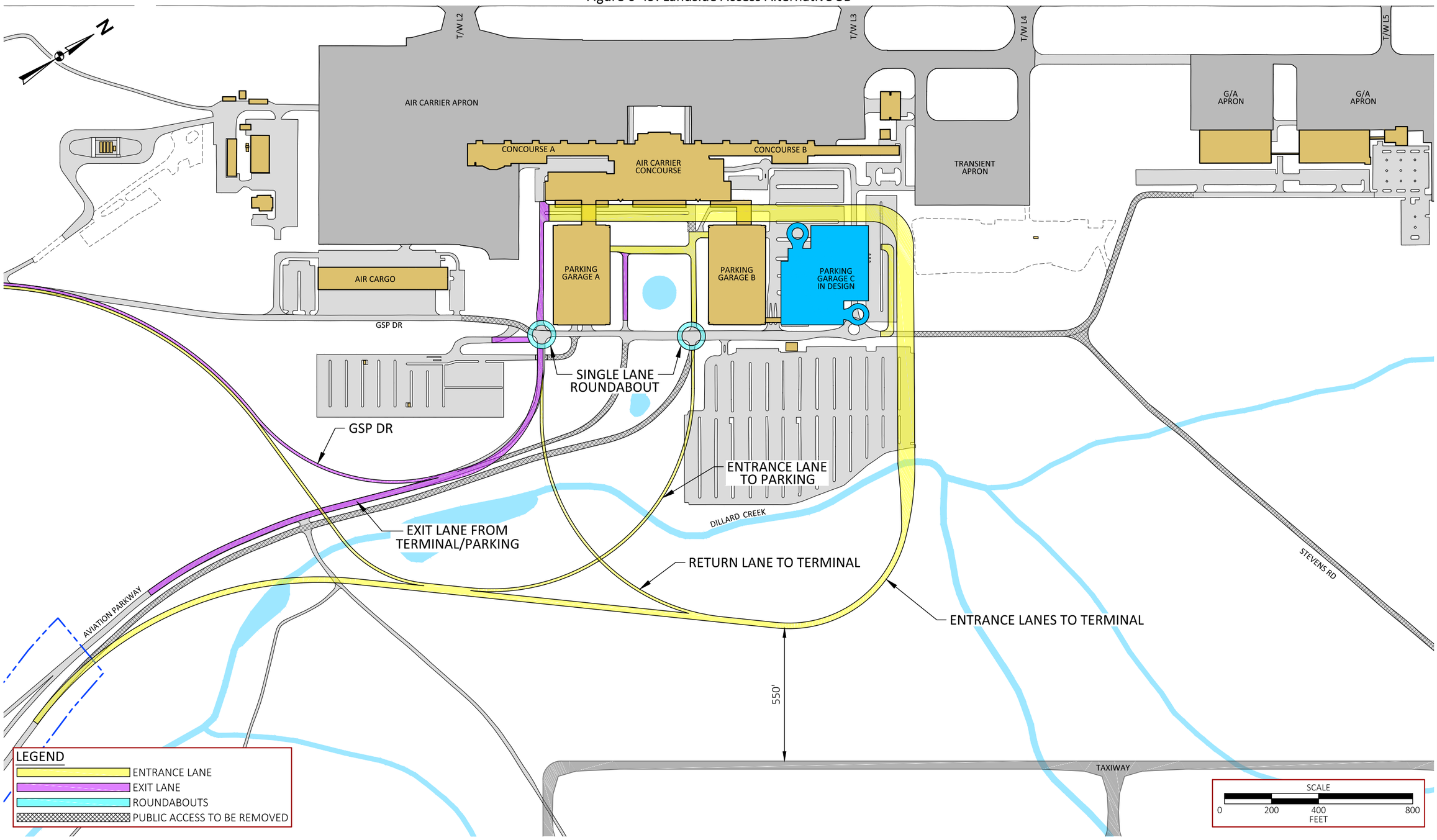
Figure 6-48: Landside Access Alternative 3A



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4C1.dwg

This page has been intentionally left blank.

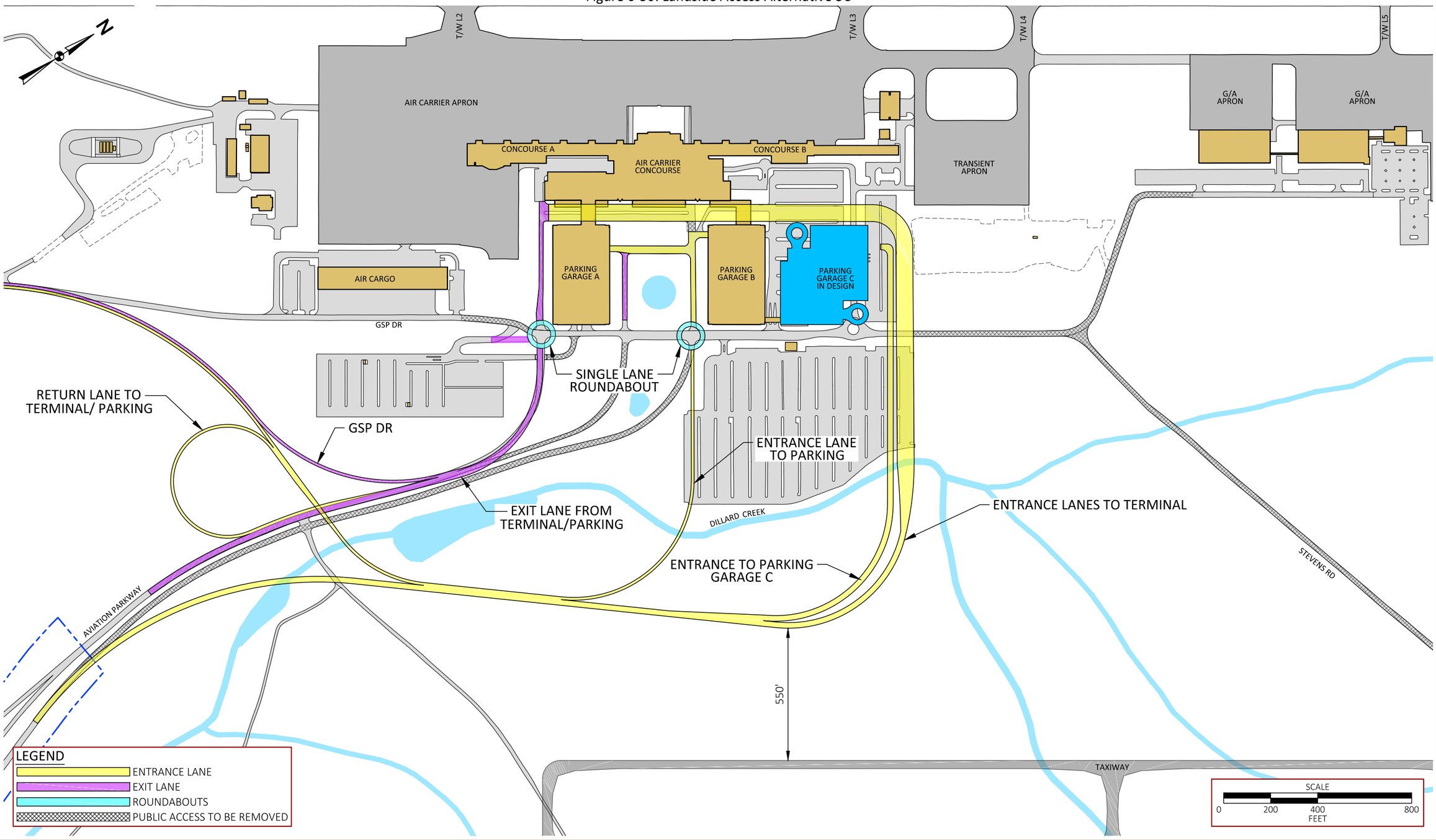
Figure 6-49: Landside Access Alternative 3B



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4C-2.dwg

This page has been intentionally left blank.

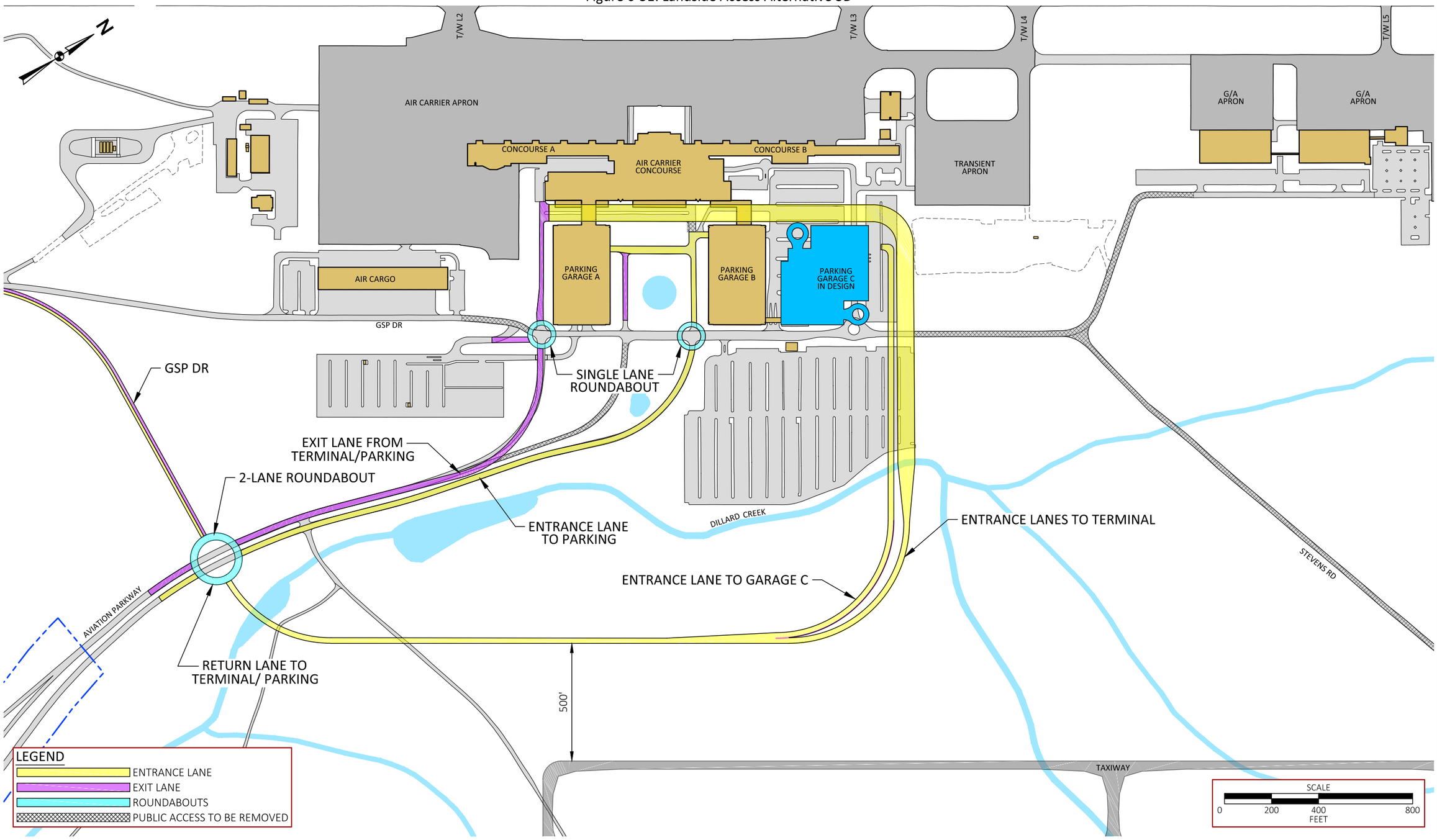
Figure 6-50: Landside Access Alternative 3C



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4C-3.dwg

This page has been intentionally left blank.

Figure 6-51: Landside Access Alternative 3D



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4C-ROUNDABOUT.dwg

This page has been intentionally left blank.

6.1.4. Air Cargo Facility Alternatives

Growth in air cargo at GSP has been significant in recent years and continues at a very high rate. Alternatives identified for additional air cargo facilities at GSP focus on expansion of the recently designed cargo apron planned to support current international air cargo operations. This planned development, located south of the North Cargo apron, has immediate and long-term potential to support air cargo activities at the Airport. Additionally, some limited future expansion to the existing North Cargo apron is possible. Should air cargo activities require additional facilities beyond that which can be accommodated in the air cargo development area, additional facilities are explored in the West Side Aviation Development Area discussed in a later section of this chapter.

Initial air cargo development alternatives explore the ability to build out the current air cargo operations area being developed and address the facility requirements and other considerations discussed below.

- Air Cargo Apron: Air cargo apron alternatives were designed with a central taxilane allowing aircraft nose-in parking to buildings on both sides. Apron size is a function of simultaneously parked aircraft being provided for in each alternative.

- Air Cargo Building: Air cargo buildings alternatives were designed to match the air cargo apron layout and to minimize distance to aircraft parking positions. Upwards of 260,000 square feet of air cargo building space is anticipated to be required by the end of the planning period and is provided for, at a minimum, in these alternatives. Air cargo building dimensions range laterally to match air cargo apron dimensions and are represented at a typical 200-foot depth for air cargo processing facilities.

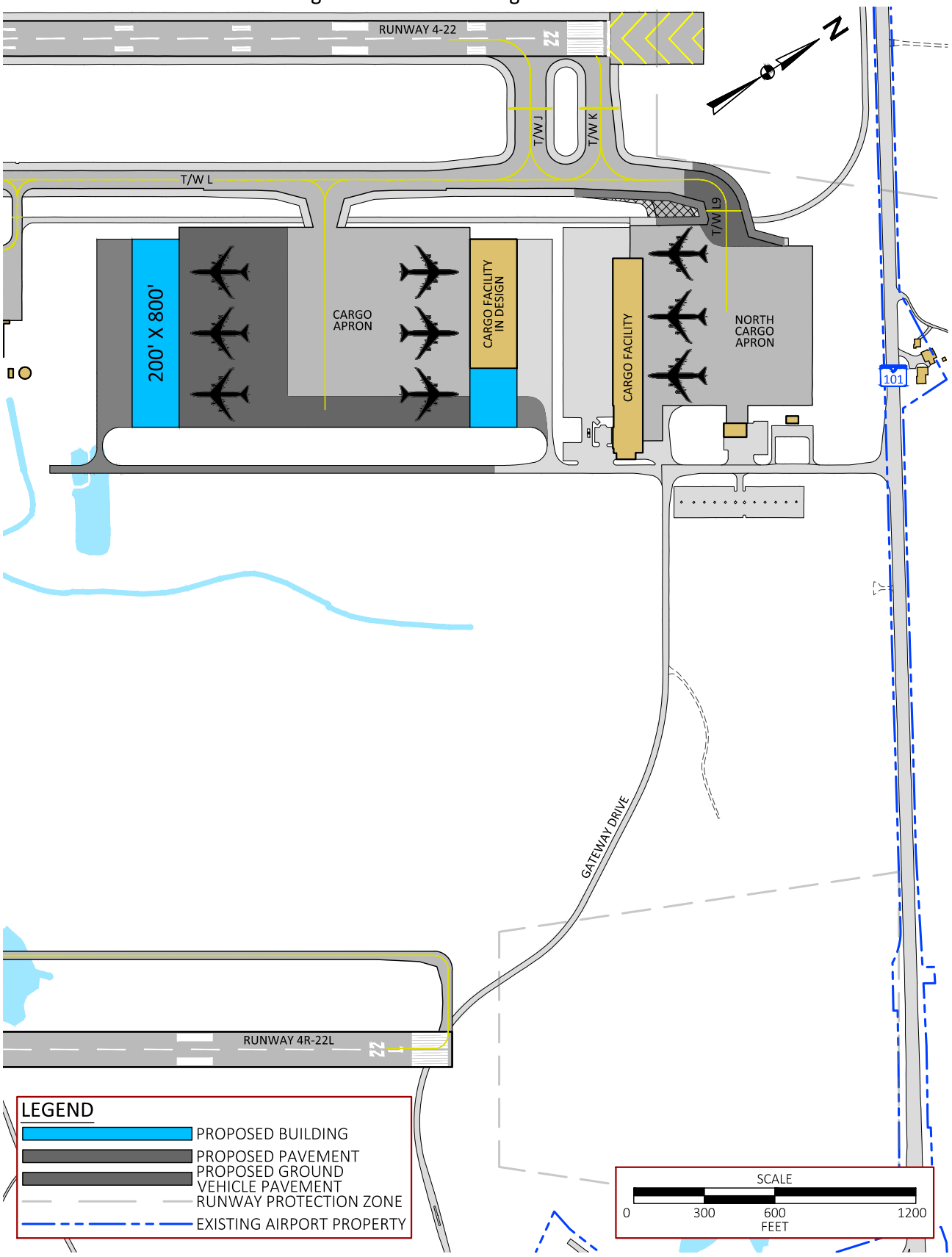
- Access Roads: Providing dedicated access to the air cargo development area from the adjacent roadway network which is segregated from the Airport's commercial terminal roadway network is common in each air cargo development alternative as each provides direct and convenient access to Highway 101. One alternative proposes utilizing the existing roadway connecting the North Cargo Apron to Highway 101, while the largest two alternatives propose relocating that roadway slightly east to allow for grade optimization in air cargo apron design while providing the most direct route to all air cargo development areas.

- Truck and Auto Docking/Parking: Ample truck docking and parking and private vehicle parking is provided for in each of the air cargo development alternatives. Landside parking lots adjacent to proposed air cargo buildings provide sufficient depth to allow for both truck docking, automobile parking, and circulation.

- Logistics Park: Airside Cargo Alternatives 2 and 3 consider development of a logistics park to support air cargo activity.

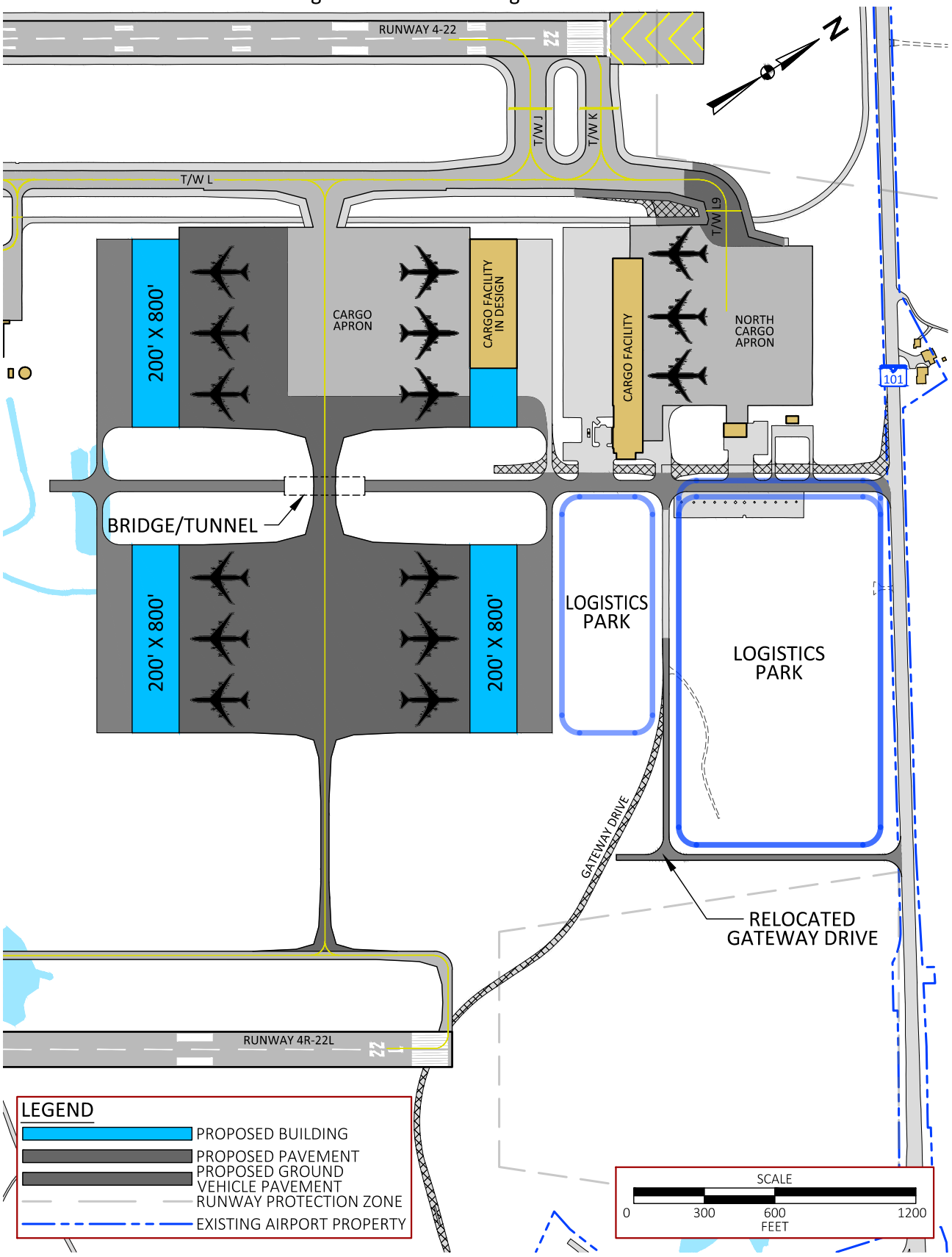
Table 6-4 details the initially identified alternatives for air cargo facility development. Figure 6-52 to Figure 6-54 depict the developed air cargo alternatives.

Figure 6-52: Airside Cargo Alternative 1



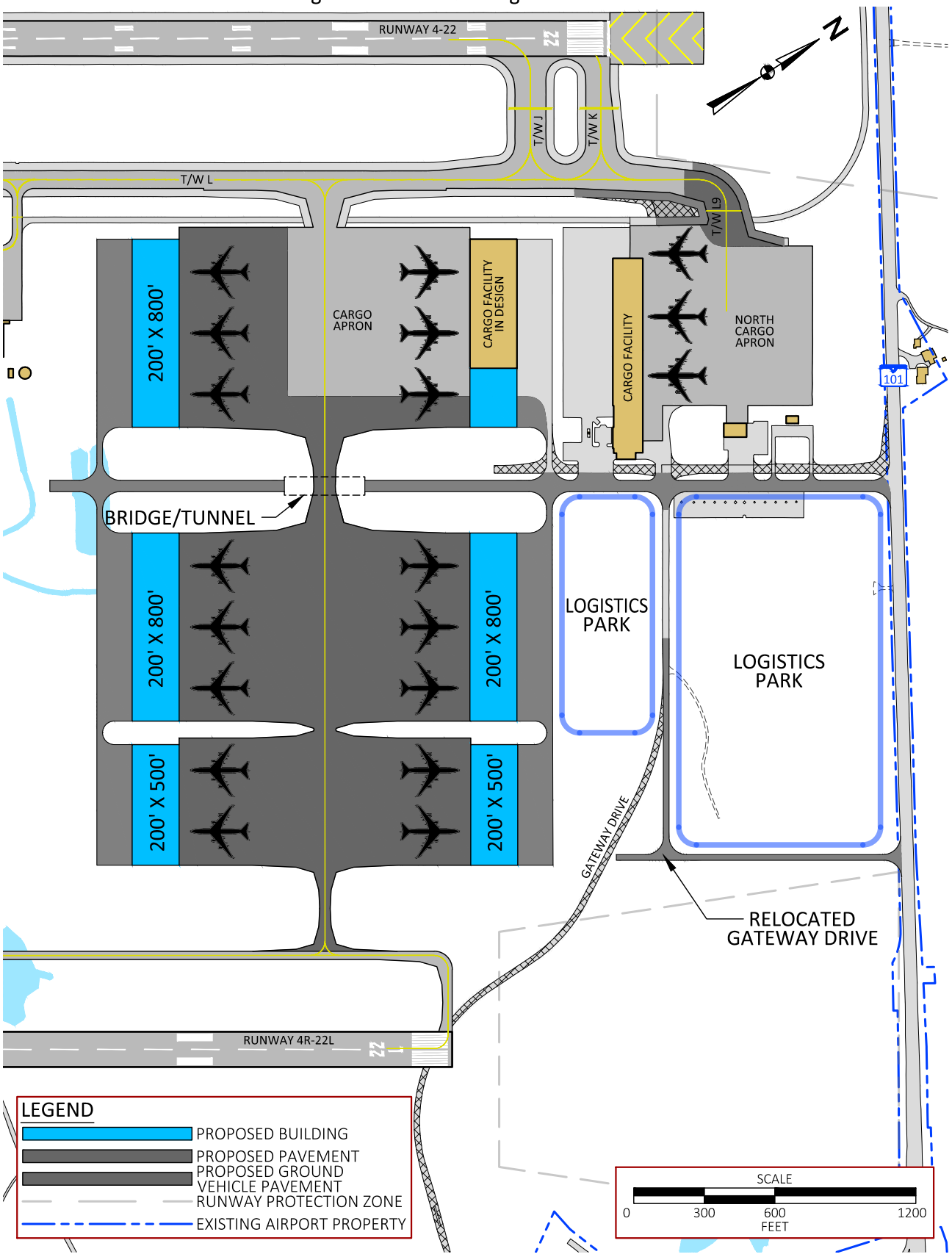
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-CARGO.dwg

Figure 6-53: Airside Cargo Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-CARGO.dwg

Figure 6-54: Airside Cargo Alternative 3



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-CARGO.dwg

Table 6-4: Identified Air Cargo Facility Alternatives

Focus	Initial Alternatives	Figure
Air Cargo Expansion	Air Cargo Alternative 1	Figure 6-52
	Air Cargo Alternative 2	Figure 6-53
	Air Cargo Alternative 3	Figure 6-54

Source: McFarland Johnson, 2018

6.1.5. General Aviation Facility Alternatives

The existing GA facilities at GSP are generally adequate to meet existing levels of activity but have little ability to support additional levels of traffic, especially based aircraft. Although GA activity is not forecasted to grow as quickly as commercial enplanements or air cargo operations, GA activity is also more difficult to predict. As GSP continues to capitalize on its appeal to GA operators, especially business jet operators, which present the strongest growing segment of GA activity, plans should be established beyond the forecasted GA need to pre-position the Airport to respond to unforeseen demands as they arise and in a manner consistent with the broader airport vision. Additionally, recognizing the future need to construct a new and updated Airport Traffic Control Tower (ATCT) at GSP, the Federal Aviation Administration (FAA) has identified a potential site near the existing GA area. This facility as well as the already designed Aircraft Rescue and Fire Fighting (ARFF) building are both identified within the GA development alternatives. The following facility requirements and other considerations guided the development of GSP GA facility development alternatives.

- **GA Apron Needs:** Additional aircraft apron is required to support general aviation activity in the future. Aircraft apron is required both for the parking and storage of transient and based aircraft, and to support requirements of future hangar demand. Facility requirement considerations suggested up to 4,100 square yards of GA apron is likely to be required for aircraft storage as well as an additional amount to match future hangar area. Each GA alternative presented provides a phaseable approach to providing expanded apron spaces capable of supporting both parked aircraft and hangar and circulation needs.

- **Operational Flexibility:** The need for operational flexibility was explored in the development of GA facility alternatives. One alternative presented limits access to ADG III aircraft in certain areas while the other alternative provides access to ADG III aircraft across the proposed GA campus.

- **Hangar Needs:** Facility requirements suggest up to 70,000 square feet of additional hangar space could be required in the future. GSP's current GA hangar facilities are exclusively large clearspan hangars capable of housing multiple aircraft. The alternative which provides ADG III access across the GA campus depicts similar large clear span hangars, while the alternative providing for areas exclusive to ADG II and smaller aircraft shows a variety of smaller hangars suitable for a variety of individual aircraft.

- **GA Terminal Building Needs:** As demand for GA facilities expand, so too will the demand on the GA terminal building. All GA Alternatives provide for the ability to double the existing FBO building size in its current location.

Table 6-5 presents anticipated facility requirements for the year 2065. Table 6-6 presents the initially identified development alternatives for the GA development area. Figure 6-55 and Figure 6-56 depict the identified GA development alternatives.

Table 6-5: General Aviation Facility Requirements

2037 Facility Requirements	Anticipated 2065 Requirements
12,000+ SF of Conventional Hangar	An additional 80,000 SF potentially required
1,000+ SY of Aircraft Apron	An additional 4,100 SY potentially required
1,000+ SF of FBO Terminal Building	An additional 4,100 SF potentially required

Note: SF = Square Feet; SY = Square Yards; FBO = Fixed-base Operator.
Source: McFarland Johnson, 2018

Table 6-6: Identified General Aviation Facility Alternatives

Focus	Initial Alternatives	Figure
ADG III Design	GA Development Area Alternative 1	Figure 6-55
Mixed Aircraft Design	GA Development Area Alternative 2	Figure 6-56

Note: ADG = Airplane Design Group.
Source: McFarland Johnson, 2018

6.1.6. Other Aviation Development Properties

West Side Aviation Development Area

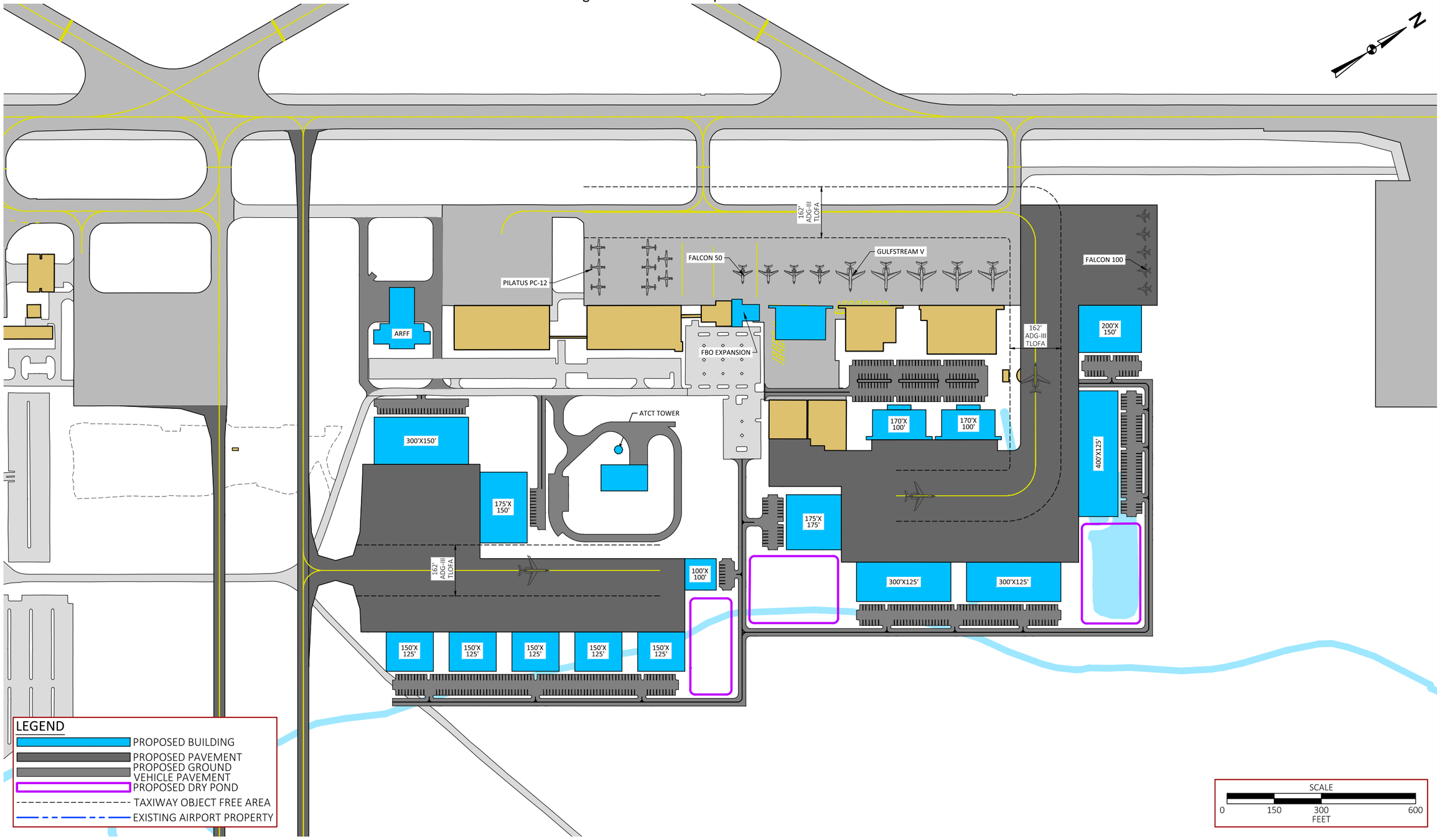
Approximately 100 acres of land at grade with Runway 4-22 exists west of Runway 22 and east of J. Verne Smith Parkway. This property is identified for aviation use in the Airport's 2013 Land Use Management Plan and was indicated on the Airport's previous ALP to be best suitable for heavy maintenance, repair, and overhaul (MRO) and/or air cargo type activities. Consistent with that plan, two alternatives were identified for the future development of this area. The following considerations guided the development of facility development alternatives in this area.

- **Maximize Developable Parcel:** Each alternative seeks to maximize the developable airfield-accessible area of the West Side Aviation Development Area while providing for adequate area for stormwater features or grading outfalls.

- **Consider Glide Slope Critical Area:** To provide access to the Runway 22 end from any development on the runway's west side, the glide slope critical area must be traversed. West Side Aviation Development Alternatives explore two methods for interacting with the glide slope critical area. One alternative proposes developing fully within the critical area and imposing operational controls on taxiing aircraft to preclude unintended glide slope signal disruption, while the other avoids the critical area to the greatest extent possible.

- **Operational Flexibility:** The need for operational flexibility was explored in the development of West Side Aviation alternatives. One alternative presented limits access to Group V aircraft in certain areas while the other alternative provides access to Group IV aircraft explicitly.

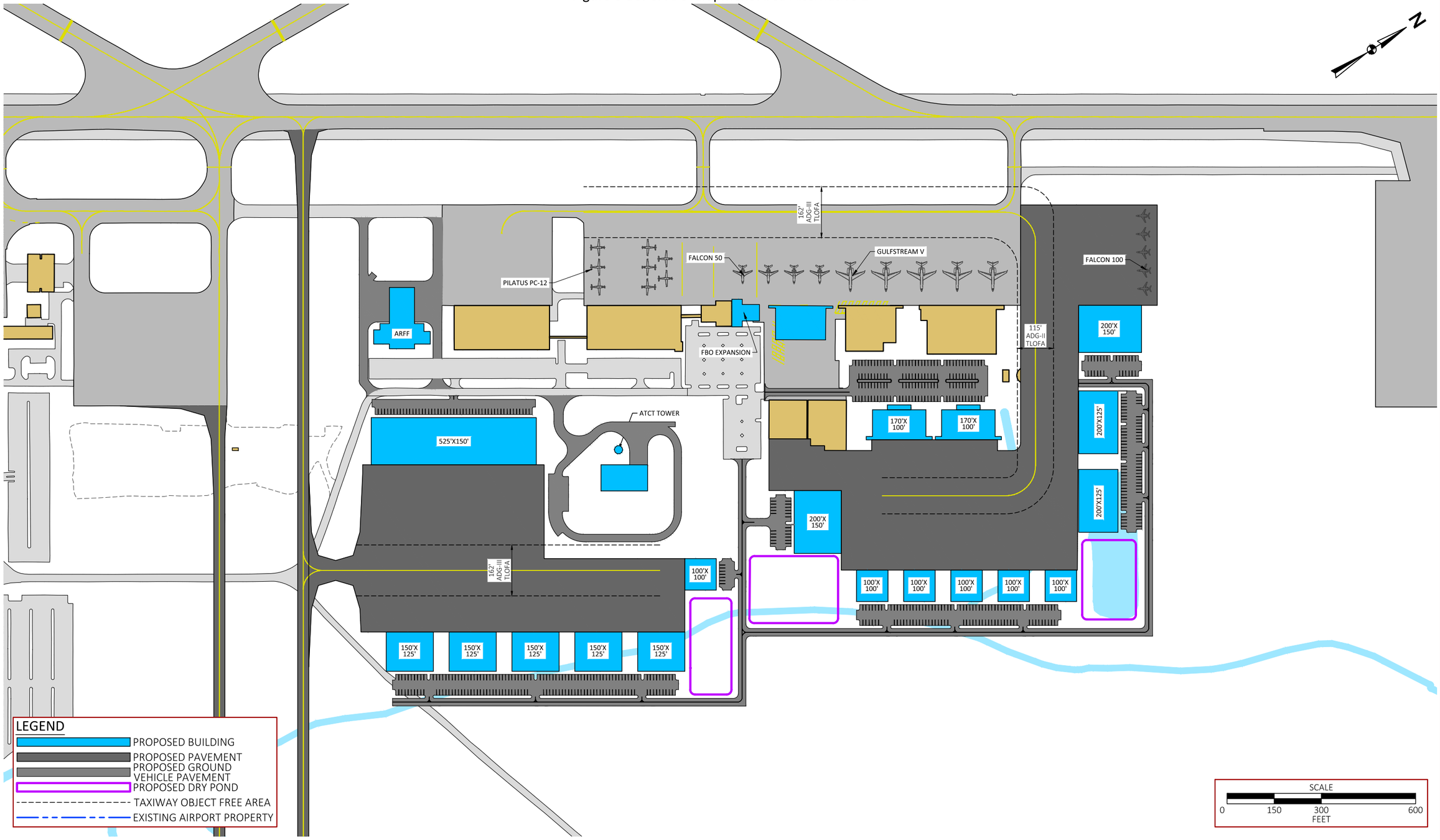
Figure 6-55: GA Development Area Alternative 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA.dwg

This page has been intentionally left blank.

Figure 6-56: GA Development Area Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA.dwg

This page has been intentionally left blank.

Table 6-7 list the identified westside aviation facility alternatives and Figure 6-57 and Figure 6-58 depict each graphically.

Table 6-7: Identified West Side Aviation Facility Alternatives

Focus	Initial Alternatives	Figure
MRO/Air Cargo Development Opportunities	West Side Aviation Development Area Alternative 1	Figure 6-57
	West Side Aviation Development Area Alternative 2	Figure 6-58

Source: McFarland Johnson, 2018

South Side Aviation Development Area

Approximately 13 acres of land exists on the southside of the airfield, east of the Runway 4 end, which was identified as having potential for aeronautical development despite being nearly 50 feet lower in elevation than Taxiway L. Discussion with Airport staff and the Technical Advisory Committee (TAC) for this master plan indicated that this property is marketable to commercial aircraft MRO operators focusing on narrowbody aircraft. As a result of existing topography, this site is only connectible to the larger airfield through the commercial air carrier apron and, potentially, through a newly constructed Taxiway L1 connector approximately 400 feet north of the Taxiway C and Taxiway L intersection.

Table 6-8 lists the identified southside aviation facility alternative and Figure 6-59 depicts the alternative graphically.

Table 6-8: Identified South Side Aviation Facility Alternatives

Focus	Initial Alternatives	Figure
Commercial Narrowbody MRO Development Opportunities	South Side Aviation Development Area 1	Figure 6-59

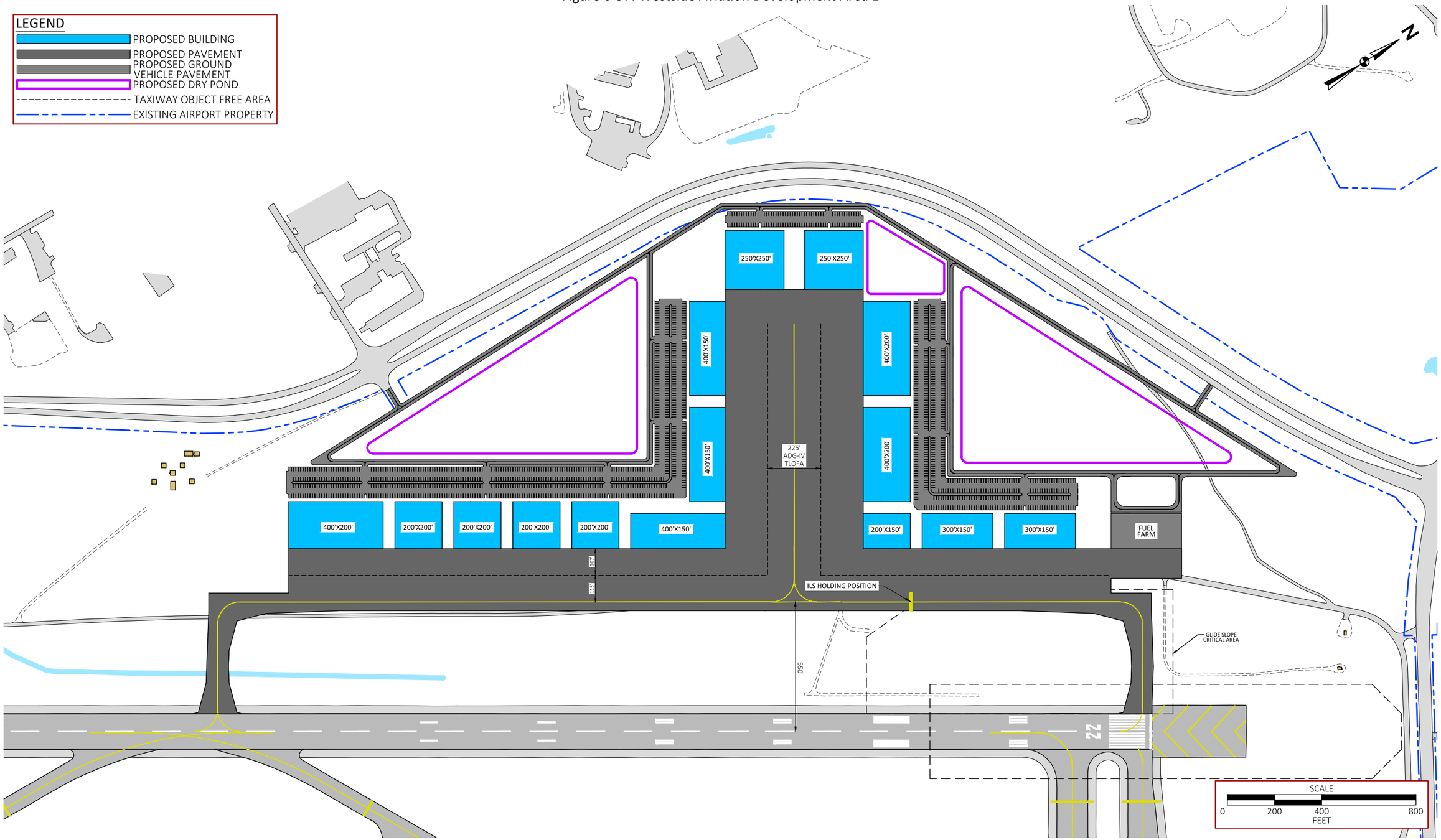
Source: McFarland Johnson, 2018

6.1.7. Support Facility Alternatives

Support facility requirements documented in Chapter 5, *Facility Requirements* include the replacement of both the ATCT and ARFF building, expansion to the airfield maintenance area to include additional service bays, concrete apron, expanded chemical storage and diesel/gas storage, a building for fuel truck maintenance, and an additional building for miscellaneous airfield maintenance equipment. Further, to support future MRO operations, a possible location for ground run-up enclosure (GRE) is also explored. Table 6-9 reviews identified support facility requirements and expresses support facility goals. Table 6-10 presents the initially identified development alternatives for support facility area. Figure 6-60 through Figure 6-62 depict the support facility alternatives.

This page has been intentionally left blank.

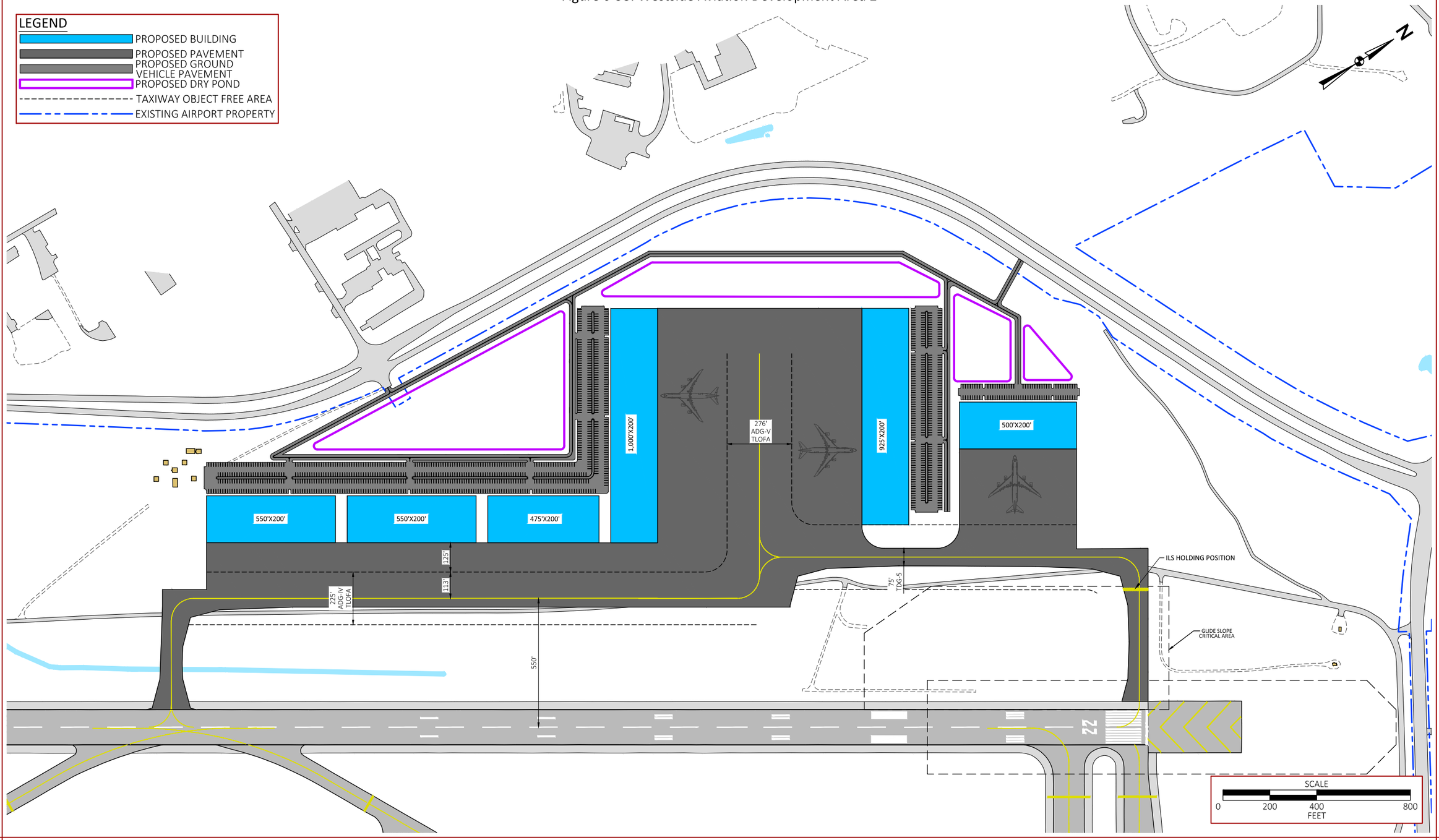
Figure 6-57: Westside Aviation Development Area 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA.dwg

This page has been intentionally left blank.

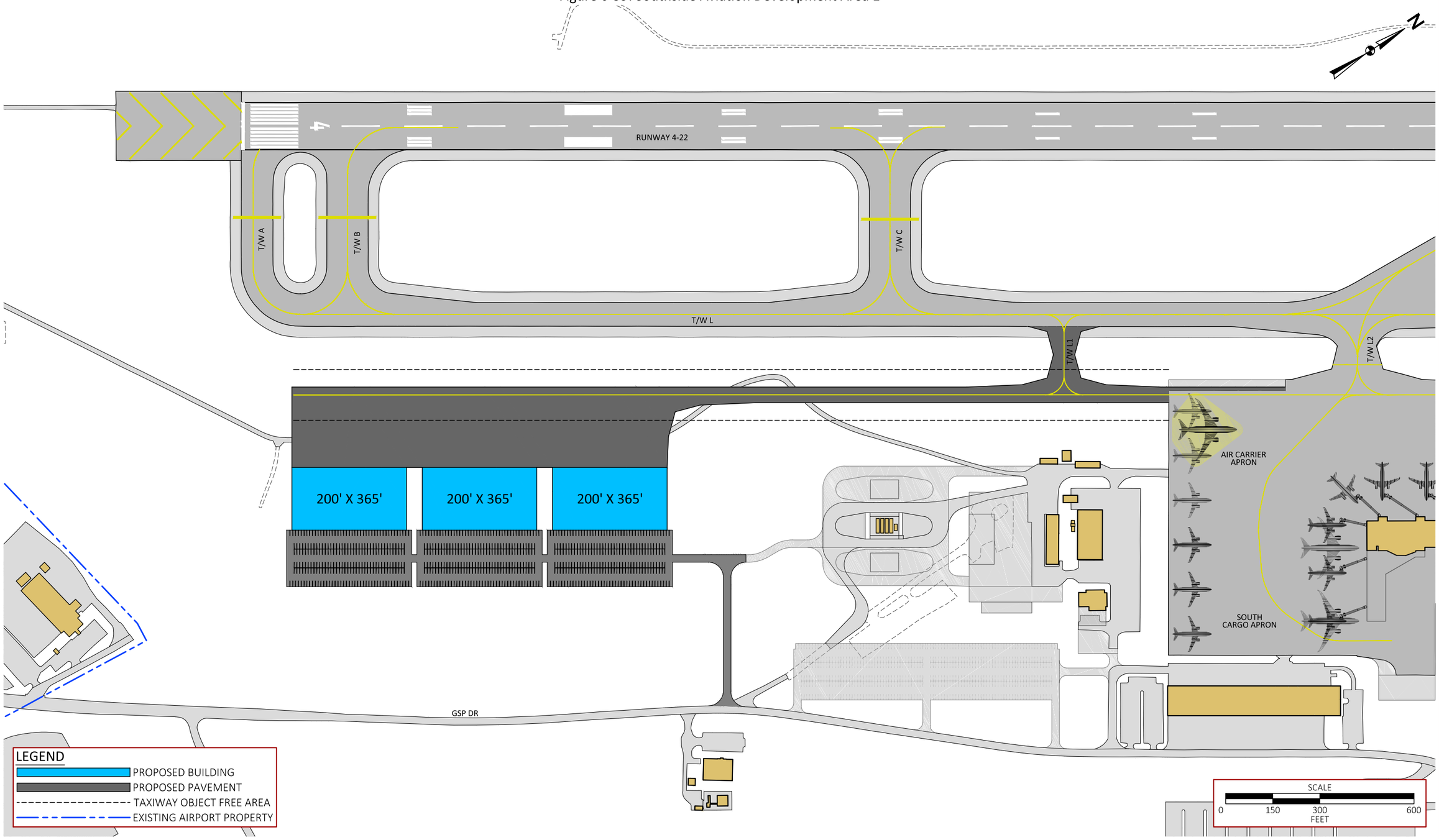
Figure 6-58: Westside Aviation Development Area 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA.dwg

This page has been intentionally left blank.

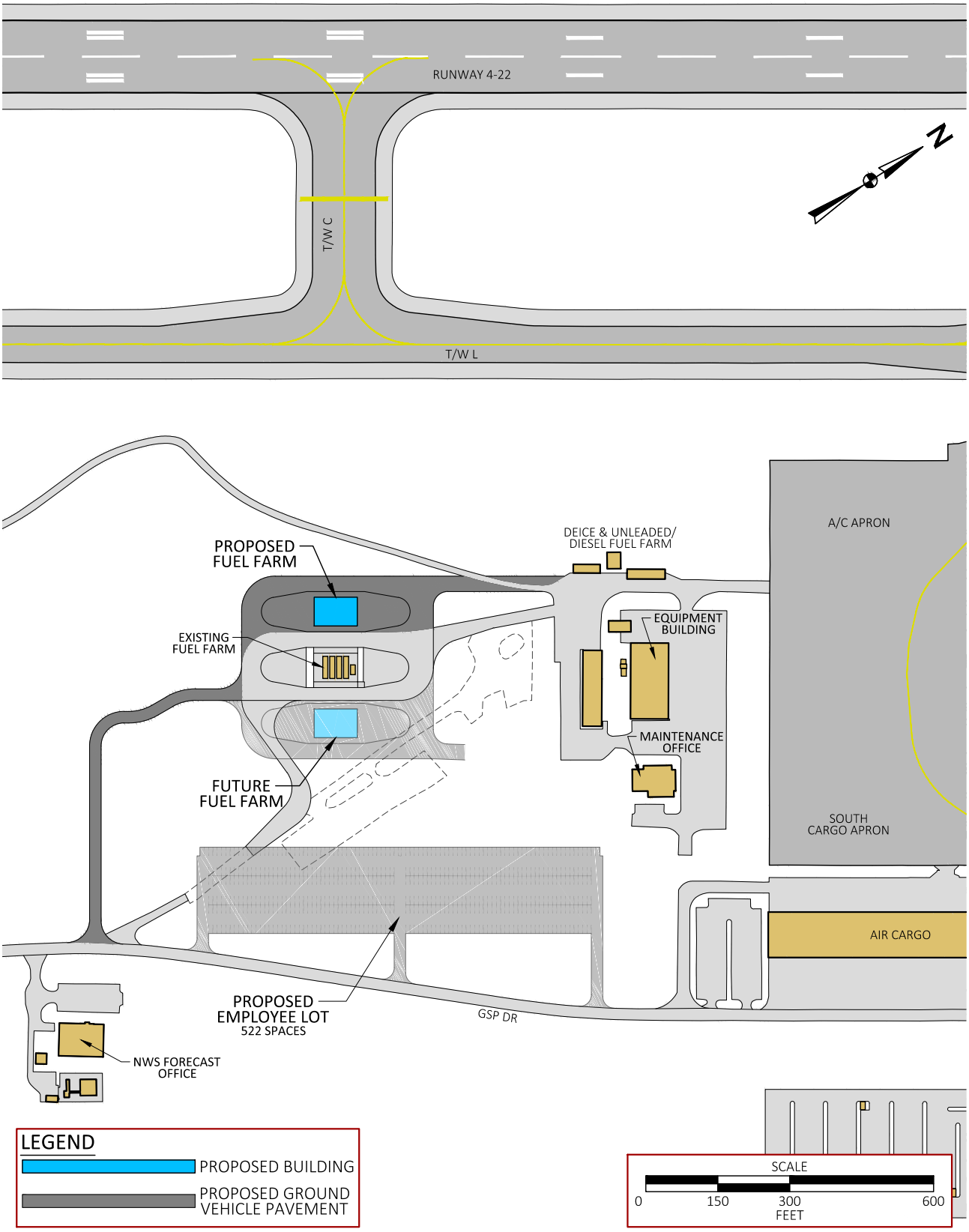
Figure 6-59: Southside Aviation Development Area 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA-REFINED.dwg

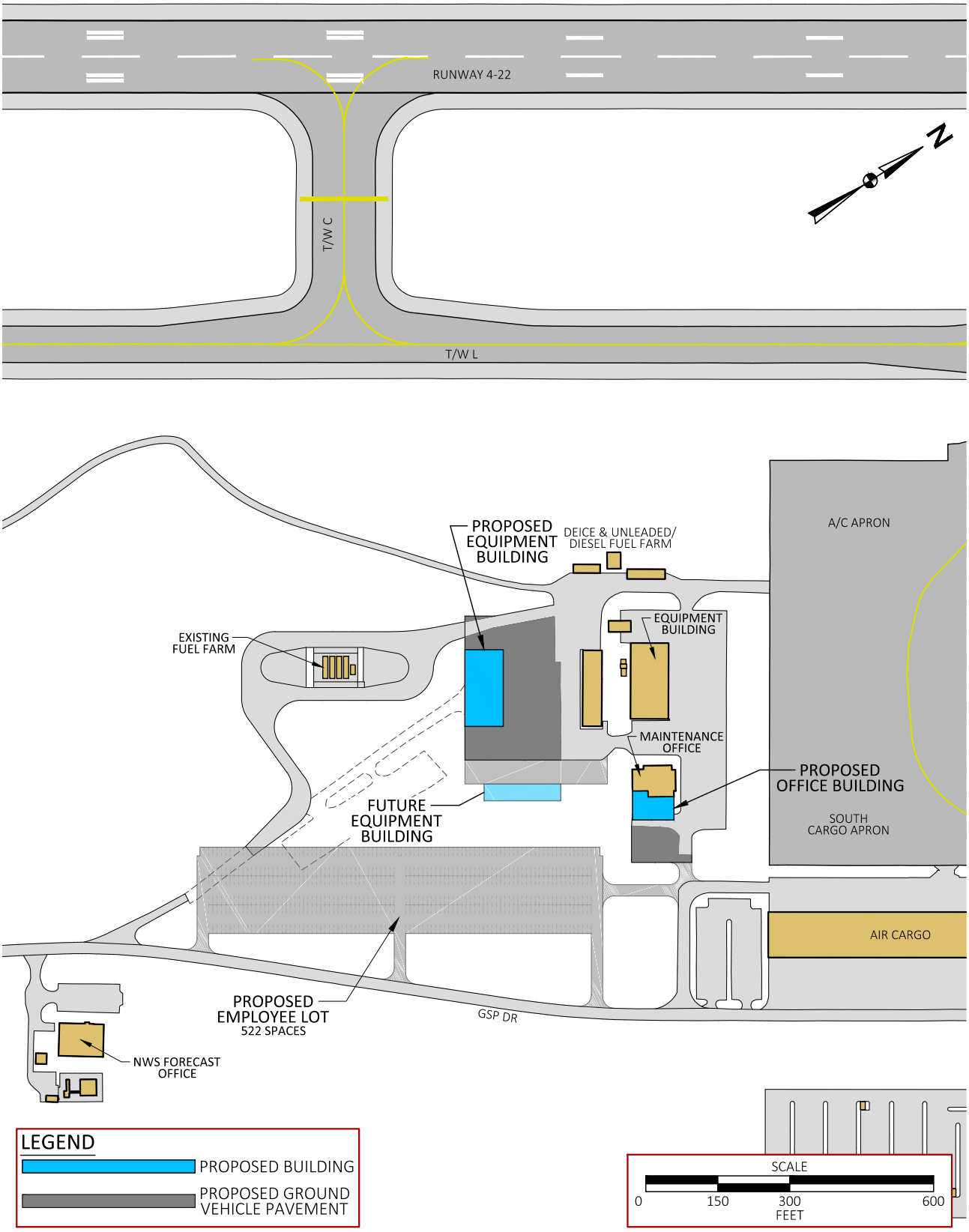
This page has been intentionally left blank.

Figure 6-60: Fuel Farm Expansion Alternative



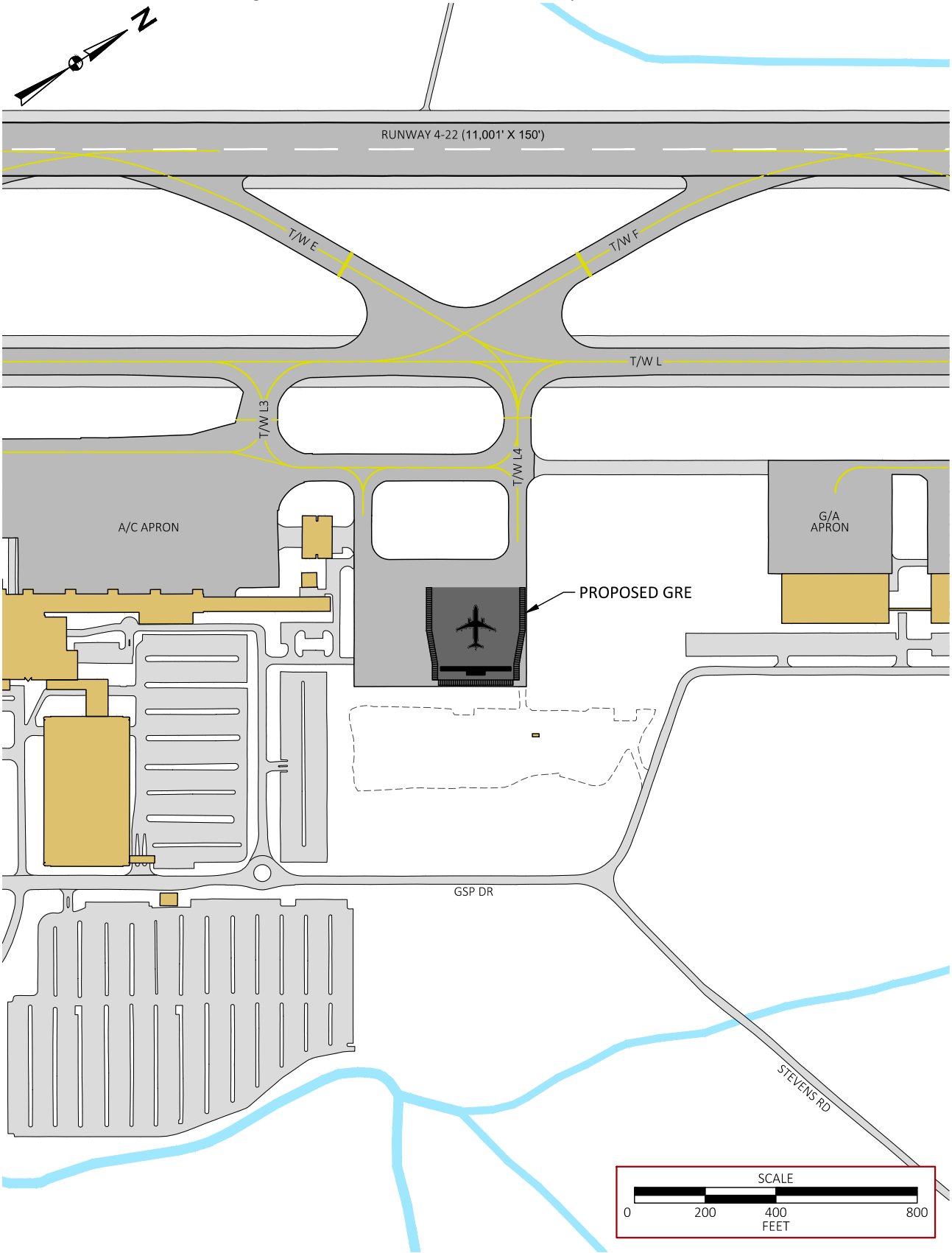
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-FUEL AND MAINTENANCE.dwg

Figure 6-61: Maintenance Yard Expansion



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-FUEL AND MAINTENANCE.dwg

Figure 6-62: Potential Ground Run Up Enclosure Site



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GRE.dwg

Table 6-9: Support Facility Requirements

Geometry/Facility Requirement	Notes
ATCT Relocation	Proposed Site Identified
ARFF Relocation	Proposed Site Identified & Building Designed
+2-3 Service/Maintenance Bays	To provide dedicated vehicle maintenance bays
Expanded Diesel/Gas Storage	–
Expanded Chemical Storage	–
New Building for Fuel Truck Maintenance	To provide space specific to the maintenance of fuel trucks and miscellaneous fueling equipment
New Building for Misc. Equipment	To ensure all equipment has under-roof storage
Expanded/New Fuel Farm for Jet-A fuel	–
Expanded Concrete Maintenance Apron	–
Future Expansion of Maintenance Offices	–

Source: McFarland Johnson, 2018

Table 6-10: Identified Support Facility Alternatives

Focus	Initial Alternatives	Figure
Fuel Farm Expansion	Fuel Farm Expansion Alternative	Figure 6-60
Maintenance Yard Expansion	Maintenance Yard Expansion	Figure 6-61
Ground Run Up Enclosure	Potential Ground Run Up Enclosure Site	Figure 6-62

Source: McFarland Johnson, 2018

6.2. REFINEMENT AND EVALUATION OF DEVELOPMENT ALTERNATIVES

6.2.1. Evaluation Criteria

The evaluation factors used to compare development options were selected based on specific considerations associated with the Airport. The preferred alternatives are selected based on assessed criteria, stakeholder discussion, and their compatibility with one another and the overall airport environment. Collectively, the individual preferred alternatives create the overall preferred airport development concept as presented in Figure 6-92 at the end of this chapter.

- Airside Alternatives
  - Facility Rqmts. /Capacity Benefits
  - Environmental Impact
  - FAA Standards
  - Operational Efficiency
  - Development Cost
  - Development Flexibility
- Terminal Airside Alternatives
  - Facility Rqmts. /Capacity Benefits
  - Environmental Impact
  - FAA Standards
  - Operational Efficiency/Flexibility
  - Constructability
  - Development Cost
  - Future Expansion Potential

- Landside Access and Parking Alternatives
  - Facility Rqmts. /Capacity Benefits
  - Environmental Impact
  - Level of Service
  - Operational Efficiency/Flexibility
  - Constructability
  - Development Cost
- Air Cargo Alternatives
  - Facility Rqmts. /Capacity Benefits
  - Environmental Impact
  - FAA Standards
  - Operational Efficiency
  - Constructability
  - Development Cost
  - Future Expansion Potential
- General Aviation Alternatives
  - Facility Rqmts. /Capacity Benefits
  - Environmental Impact
  - FAA Standards
  - Operational Efficiency
  - Development Cost
  - Development Flexibility
  - Land Use Compatibility
  - Revenue Generation Potential

6.2.2. Refined Alternatives and Evaluation

The following sections will discuss the advancement and refinement of selected alternatives relative to each of the functional development areas of the Airport, as well as evaluate the refined alternatives and identify a series of preferred alternatives. All alternatives are evaluated against others in their functional area relative to the focus of the improvement being considered, as well as a "No Build" alternative.

Airside Alternatives

Of the airside alternatives presented in Section 6.1.1, the majority were retained. Those further refined are as follows:

- Parallel Runway: The two parallel runway alternatives providing the longest runway length were retained. These alternatives both provide for 4,300-foot separation between runways thereby enabling simultaneous precision instrument approach/departure operations, and each are capable of supporting operations by the largest aircraft operating at GSP. While the 6,500-foot runway length option would provide for fully standard runway protection zones (RPZ) off each runway end, the 7,000-foot runway length option would push the future Runway 4R RPZ south such that Aviation Parkway would cross its southwestern most corner. Calculation of critical aircraft operational performance suggest that the additional 500 feet of runway provided for in the 7,000-foot runway alternative could increase load factors by up to four percent (over 80 percent of maximum takeoff weight for the 747-8F).

- Crossfield Taxiway: All of the crossfield taxiway alternative concepts were retained, but each was refined to provide for ADG V aircraft, thereby ensuring that the future parallel runway is fully accessible and usable by widebody aircraft, including the current and future design aircraft the Boeing 747-400F and 747-800F, respectively.

- **Apron Edge Taxilane:** The initial apron edge taxilane alternative 3 depicted in **Figure 6-18** was retained and refined to provide for TDG-3 aircraft from Taxiway L3 to Taxiway L6.

The retained and refined airside alternatives are identified in **Table 6-11**. **Figure 6-63** through **Figure 6-66** present the refined airfield development alternatives, all other airside alternatives were retained as depicted in Section 6.1.1.

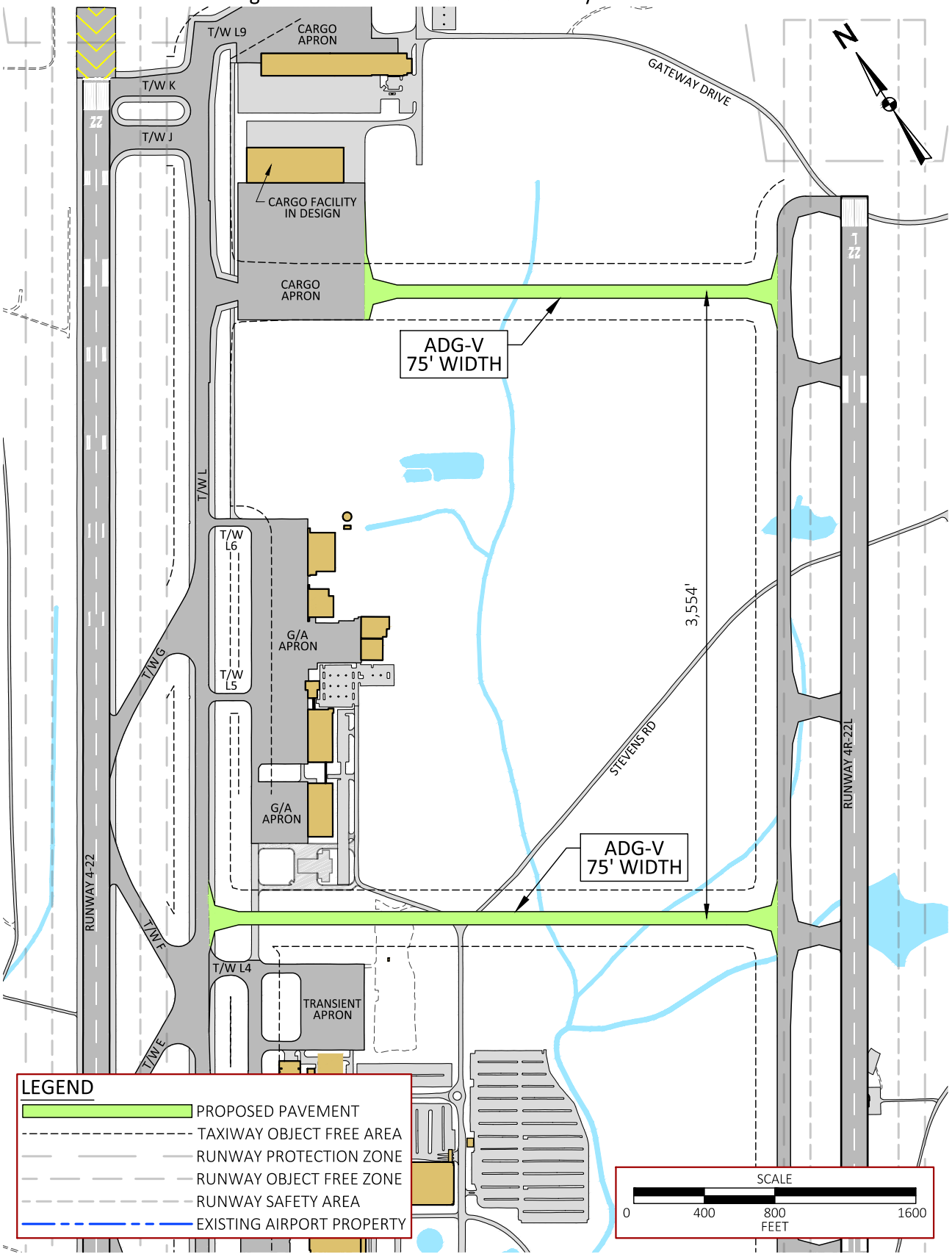
Table 6-11: Retained and Refined Airside Alternatives

Geometry/Facility Requirement	Initial Alternatives	Refinement	Figure
Parallel Runway	6,500’ RWY – 4,300’ SE of RWY 4-22	None	Figure 6-3
	7,000' RWY – 4,300' SE of RWY 4-22	None	Figure 6-4
Crossfield Taxiway	Dual Parallel on Transient Apron	ADG V Design	**Figure 6-63**
	Dual Parallel on Expanded Transient Apron	ADG V Design	**Figure 6-64**
	Split Dual Parallel – Transient/Cargo Apron	ADG V Design	**Figure 6-65**
Wide Expanse of Pavement Co-Location of Rapid Exit Taxiway Direct Access	TWY E & F Removal	None	Figure 6-9
	Remove Taxiway E & F, Add 90° TWY	None	Figure 6-11
Direct Access	TWY L2 South	None	Figure 6-13
	TWY L2 North		Figure 6-14
Taxiway Fillet	Fillet Widening for TDG-6 on TWY A/B/J/K	None	Figure 6-15
Apron Edge Taxilane	TDG 3/2 TWY Between TWY L4 and TWY L6	TDG-3 Only	**Figure 6-66**
Approach Lighting System	2,400' ALSF-II in Runway 22 Approach Zone	None	Figure 6-20
Runway Entrance/Exit Taxiway	Taxiway H Development	None	Figure 6-21
90-Degree Apron Entrance	Taxiway L9 Realignment	None	Figure 6-22

Notes: RWY = Runway, TWY = Taxiway

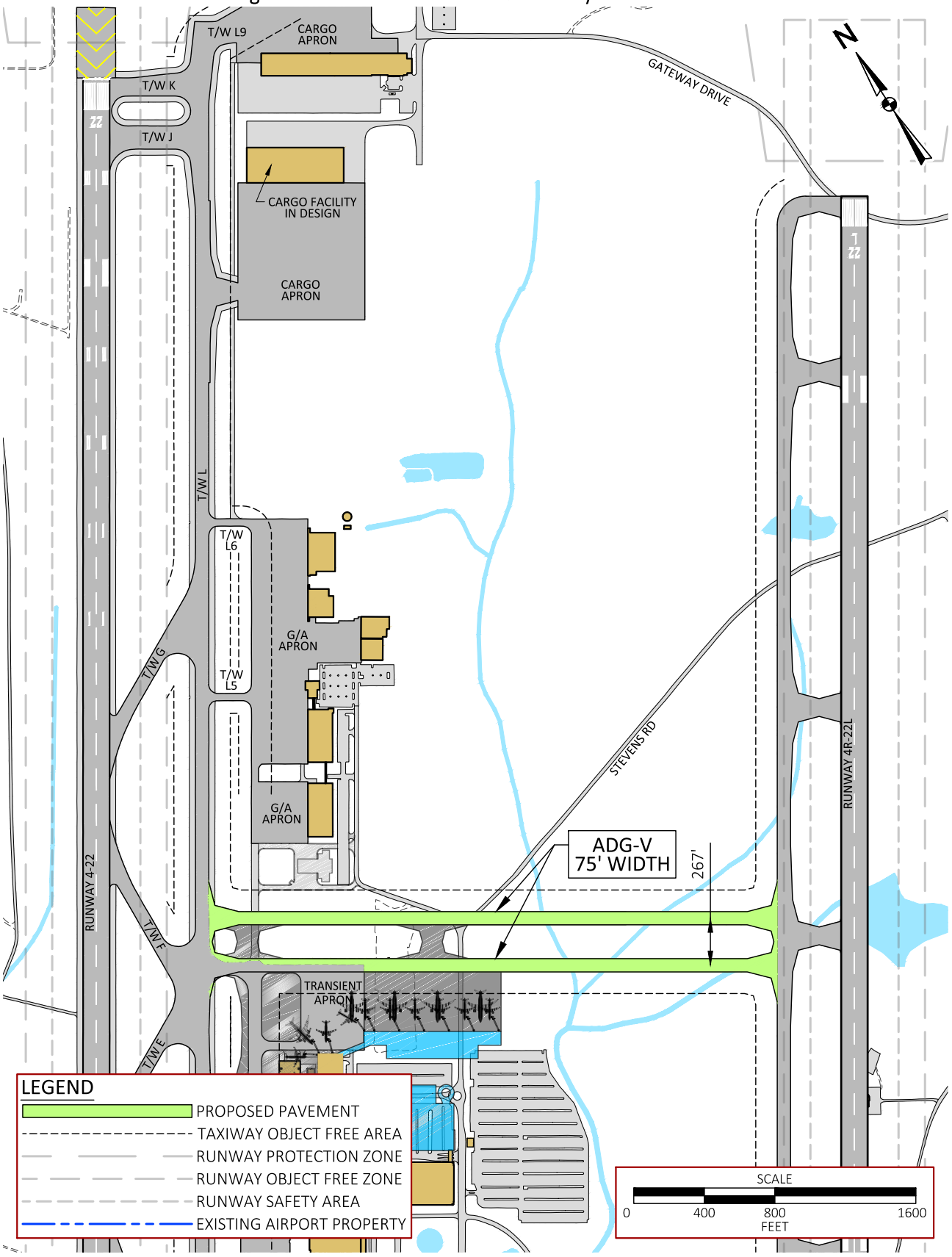
Source: McFarland Johnson, 2018

Figure 6-63: Refined Crossfield Taxiway Alternative 1



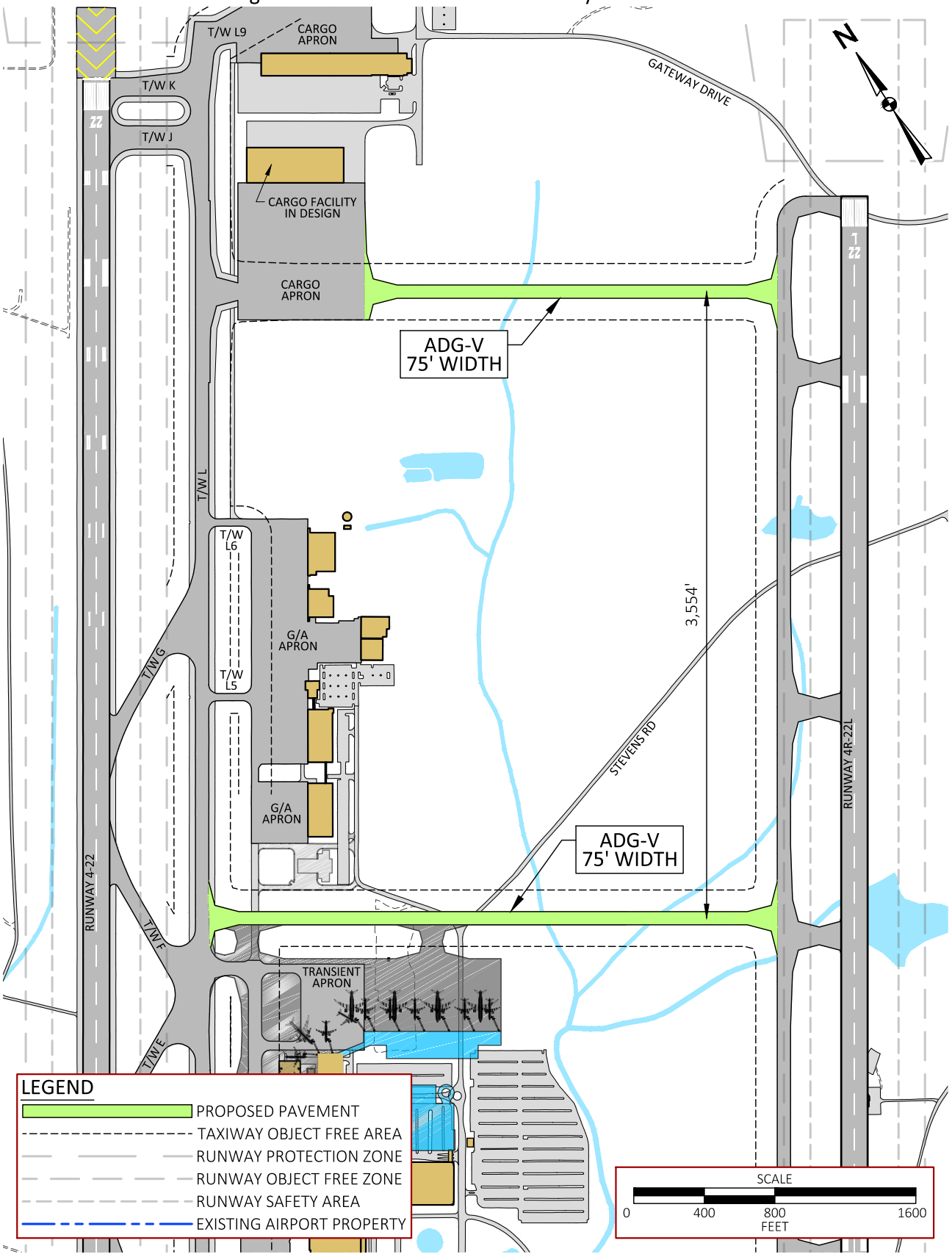
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY CROSSFIELD-REFINED.dwg

Figure 6-64: Refined Crossfield Taxiway Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY CROSSFIELD-REFINED.dwg

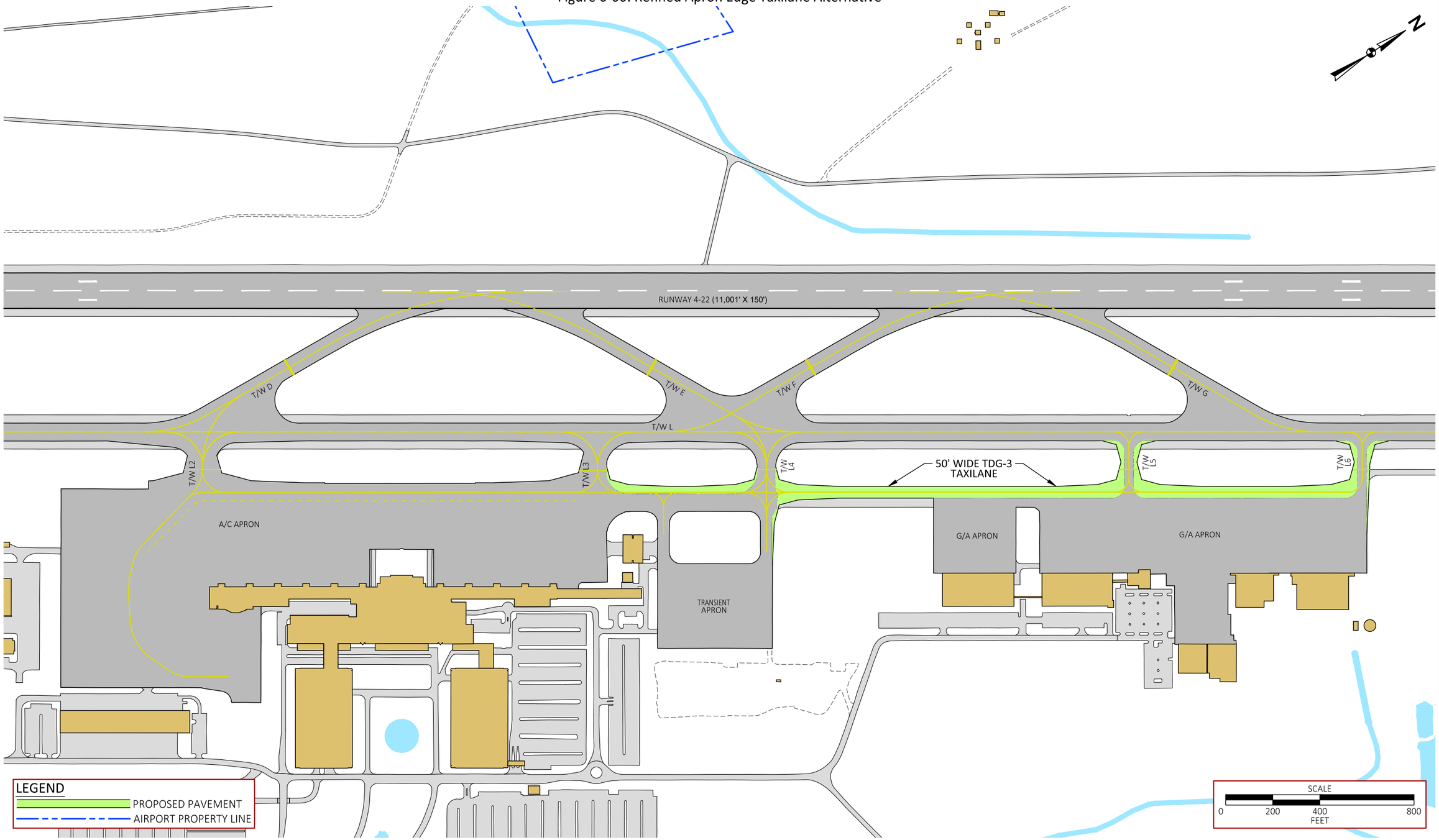
Figure 6-65: Refined Crossfield Taxiway Alternative 3



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXIWAY CROSSFIELD-REFINED.dwg

This page has been intentionally left blank.

Figure 6-66: Refined Apron Edge Taxilane Alternative



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TAXILANE CONNECTOR-REFINED.dwg

This page has been intentionally left blank.

Evaluation

Through direct engagement with Airport staff and the TAC organized specifically for this effort, the retained and refined airfield alternatives were scored using the airfield evaluation criteria previously presented. Each alternative was scored individually but ranked against similar alternatives as well as a no build alternative. **Table 6-12** depicts the results of that analysis and identification of the high scoring alternatives.

Table 6-12: Airfield Alternative Evaluation

Airfield Alternative	Facility Requirement	Environmental Impact	FAA Standards	Operational Efficiency	Development Cost	Development Flexibility	TOTAL
6,500' RWY – 4,300' SE of RWY 4-22	1	2	3	2	2	3	13
7,000' RWY - 4,300' SE of RWY 4-22	3	1	2	3	2	3	14
No Build	0	3	0	0	3	2	8
Refined Dual Parallel on Transient Apron	3	2	3	3	3	2	15
Refined Dual Parallel on Expanded Transient Apron	3	2	3	2	3	2	16
Refined Split Dual Parallel - Transient/Cargo Apron	3	2	3	3	3	3	17
No Build	0	3	0	0	3	0	6
TWY E & F Removal	3	3	3	1	3	3	19
Remove TWY E & F, Add 90° TWY	3	2	3	2	2	3	17
No Build	0	3	0	3	3	0	9
TWY L2 South	3	2	3	1	2	1	12
TWY L2 North	3	2	3	2	2	2	14
No Build	3	3	3	3	3	3	18
Fillet Widening for TDG-6 on TWY A/B/J/K	3	2	3	3	2	3	16
No Build	3	3	3	2	3	3	17
TDG 3 TWY Between TWY L4 and TWY L6	3	2	3	3	2	2	15
No Build	0	3	3	1	3	1	11
2,400' ALSF-2 in RWY 22 Approach Zone	3	2	3	3	2	3	16
No Build	0	3	3	1	3	3	13
TWY H Development	3	2	3	3	2	3	16
No Build	0	3	3	1	3	3	13
TWY L9 Realignment	3	2	3	3	2	3	16
No Build	0	3	3	1	3	3	13

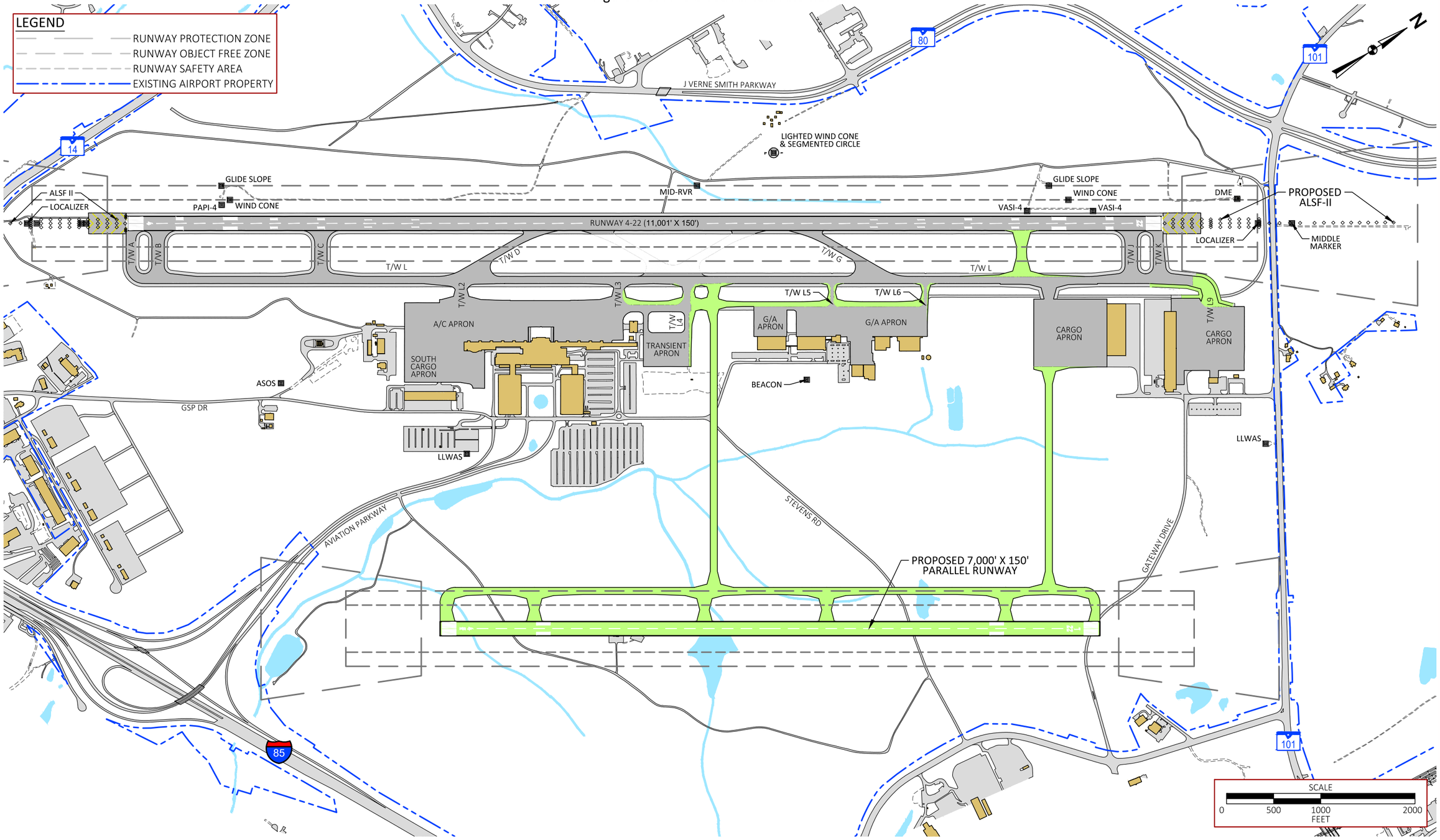
Notes: RWY = Runway, TWY = Taxiway

Source: McFarland Johnson, 2018

Figure 6-67 depicts each of the preferred identified alternatives to cumulatively present the preferred airside development plan for GSP.

This page has been intentionally left blank.

Figure 6-67: Preferred Airfield Alternative



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PREFERRED-AIRSIDE.dwg

This page has been intentionally left blank.

Terminal Airside Alternatives

Of the terminal airside alternatives presented in Section 6.1.2, three Concourse A alternatives, two Concourse B alternatives, and one Terminal 2 long-range alternative were retained for refinement. Additionally, two new alternatives were developed as part of the refinement of terminal airside alternatives. One explores a blended Concourse A/B expansion alternative, while the other examines the ability to additionally integrate Terminal 2 in the long-term. These refinements and new concepts are as follows:

- **Concourse A:** Concourse A development alternatives A1-Ground, A3-International, and A4-International were retained and refined for further analysis. In all refinements, building footprints were optimized, RON parking positions identified, hardstand position B4.5 is outfitted with a gate to become Gate B5, and the proposed Concourse B side baggage claim was reduced slightly. Further, both international alternatives were refined to reflect ample GSE storage potential inherent to each alternative.

- **Concourse B:** Concourse B development alternative B1-Ground and B2-Ground were retained and refined for further analysis. Each was refined to optimize building footprint, identify RON parking positions and resize Concourse B side baggage claim.

- **Blended:** This new blended alternative presents concepts A1-Ground and B1-Gound together reflecting a terminal with 18 gated narrowbody hardstands (three of which could flex to support two international widebody aircraft), four ungated narrowbody hardstand positions, six narrowbody RON positions (two of which could be flexed to support a single widebody aircraft), and expanded GRE yard with support building.

- **Terminal 2:** One future Terminal 2 alternative was retained and refined to separate the apron edge taxilane from the Crossfield taxiway and permit dual use of taxiway pavements. Additionally, the newly developed blended alternative as discussed above was included with the Terminal 2 concept as a new long-term terminal alternative.

Table 6-13 tabulates these new and refined alternatives.

Table 6-13: Retained and Refined Terminal Airside Alternatives

Focus	Initial Alternatives	Refinement	Figure
Concourse A	Terminal Alternative A1 – Ground	Reduced building size / Identified RON and deicing positions / Resized proposed baggage claim / Hardstand B4.5 becomes gated	Figure 6-68
	Terminal Alternative A3 – International	Reduced building size / Relocated widebody flex gates / Identified RON positions / Expanded GSE apron / Resized proposed baggage claim / Hardstand B4.5 becomes gated	Figure 6-69

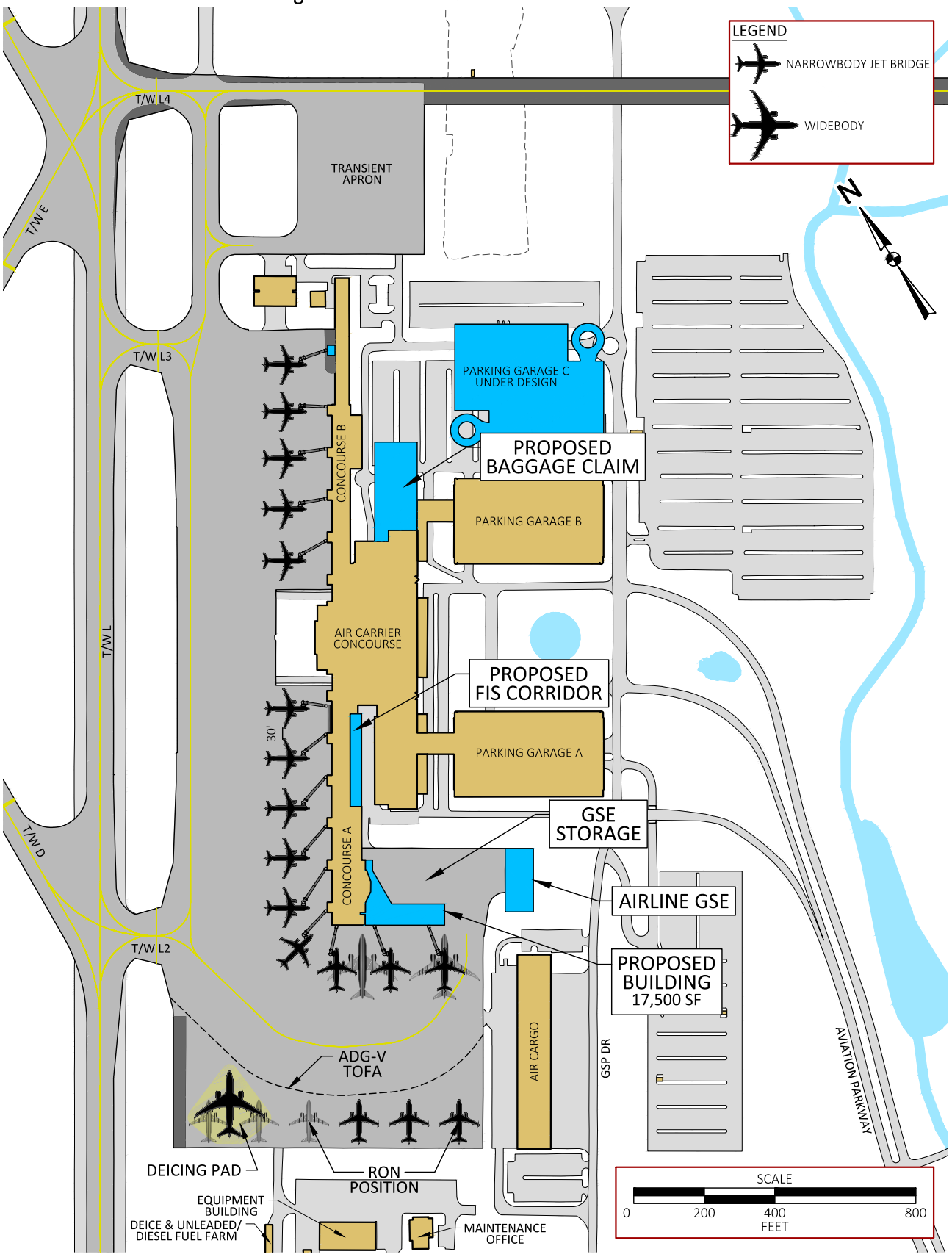
	Terminal Alternative A4 – International	Modified building footprint / Relocated widebody flex gates / Optimized gate potential / Expanded GSE Apron / Resized proposed baggage claim / Hardstand B4.5 becomes gated	Figure 6-70
Concourse B	Terminal Alternative B1 – Ground	Reduced building size / Identified RON positions / Expanded GSE apron / Resized proposed baggage claim	Figure 6-71
	Terminal Alternative B2 – Ground	Increased building size / Expanded apron Identified RON positions / Expanded GSE apron / Resized proposed baggage claim	Figure 6-72
Blended	New Terminal Alternative A1/B1 – Ground	Paired refined A1 and B1 Alternatives	Figure 6-73
Terminal 2	Terminal Alternative B3 – International	Separated apron taxilane from crossfield taxiway	Figure 6-74
	New Terminal Alternative B3	Paired A1 and B1 with Terminal 2 concept	Figure 6-75

Source: McFarland Johnson, 2018

The short-listed alternatives were selected and refined based on detailed review and consideration of the planning team and Airport stakeholders. Stakeholder and community engagement is documented at the end of this report. Maximizing the aeronautical utility of existing pavements on the air carrier apron, providing for long term growth in commercial activity, and maintaining a commitment to the Airport's aesthetic and park-like feel were central considerations. Also, the desire to maintain a balanced distribution of gates across the terminal concourses also became a guiding consideration of this effort as the alternatives were refined.

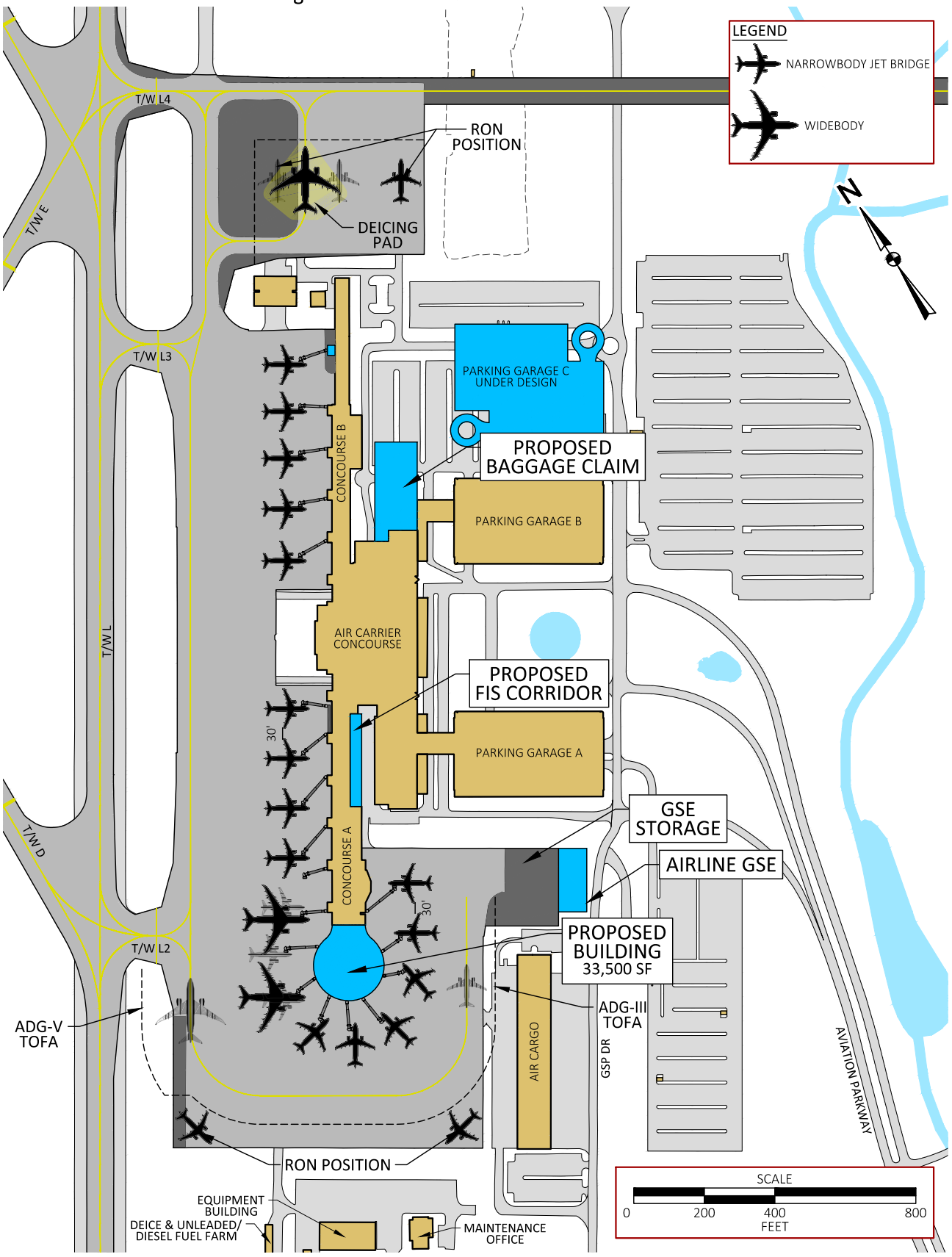
Figure 6-68 through Figure 6-75 present the refined terminal airside alternatives.

Figure 6-68: Refined Terminal Alternative 1



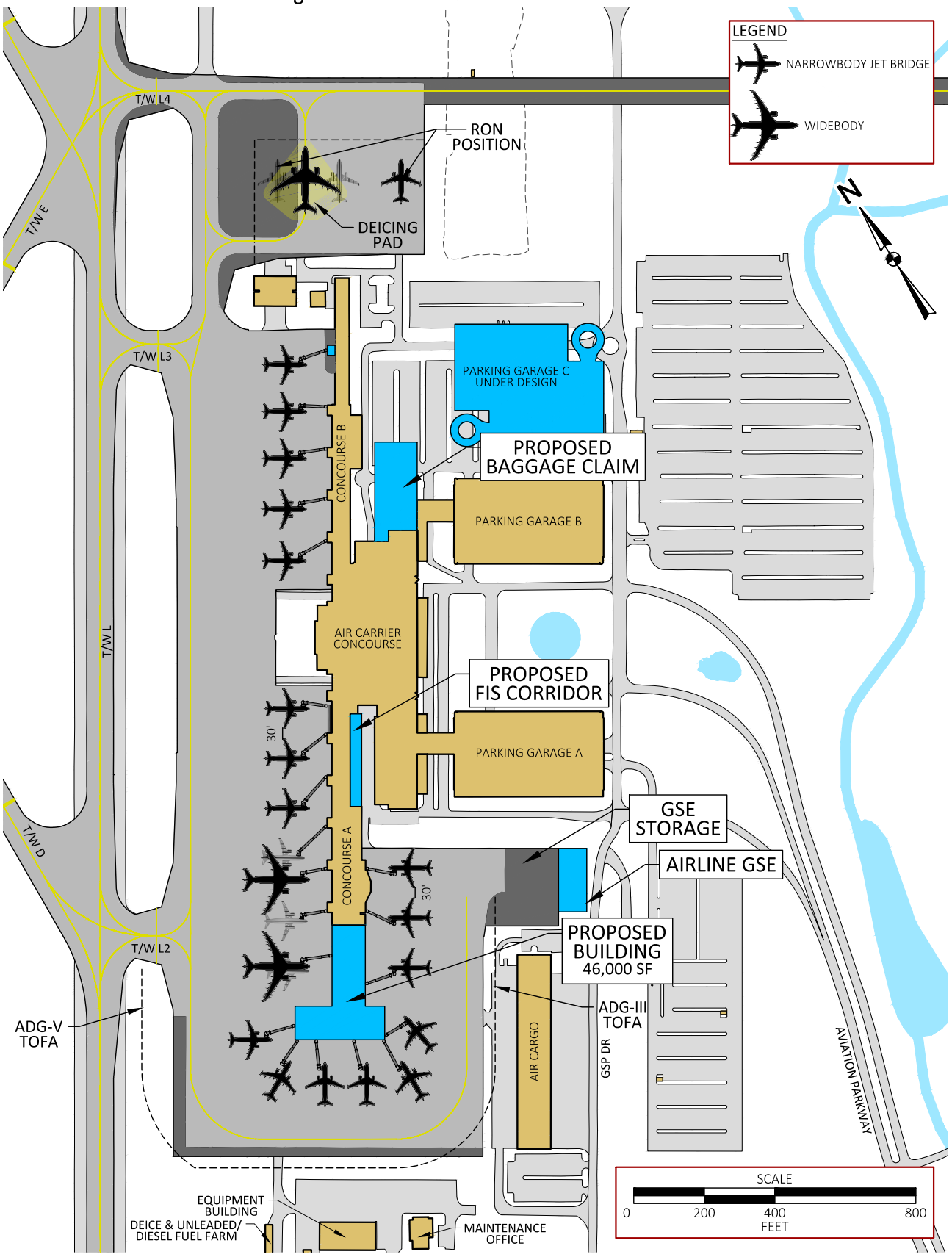
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-69: Refined Terminal Alternative 2



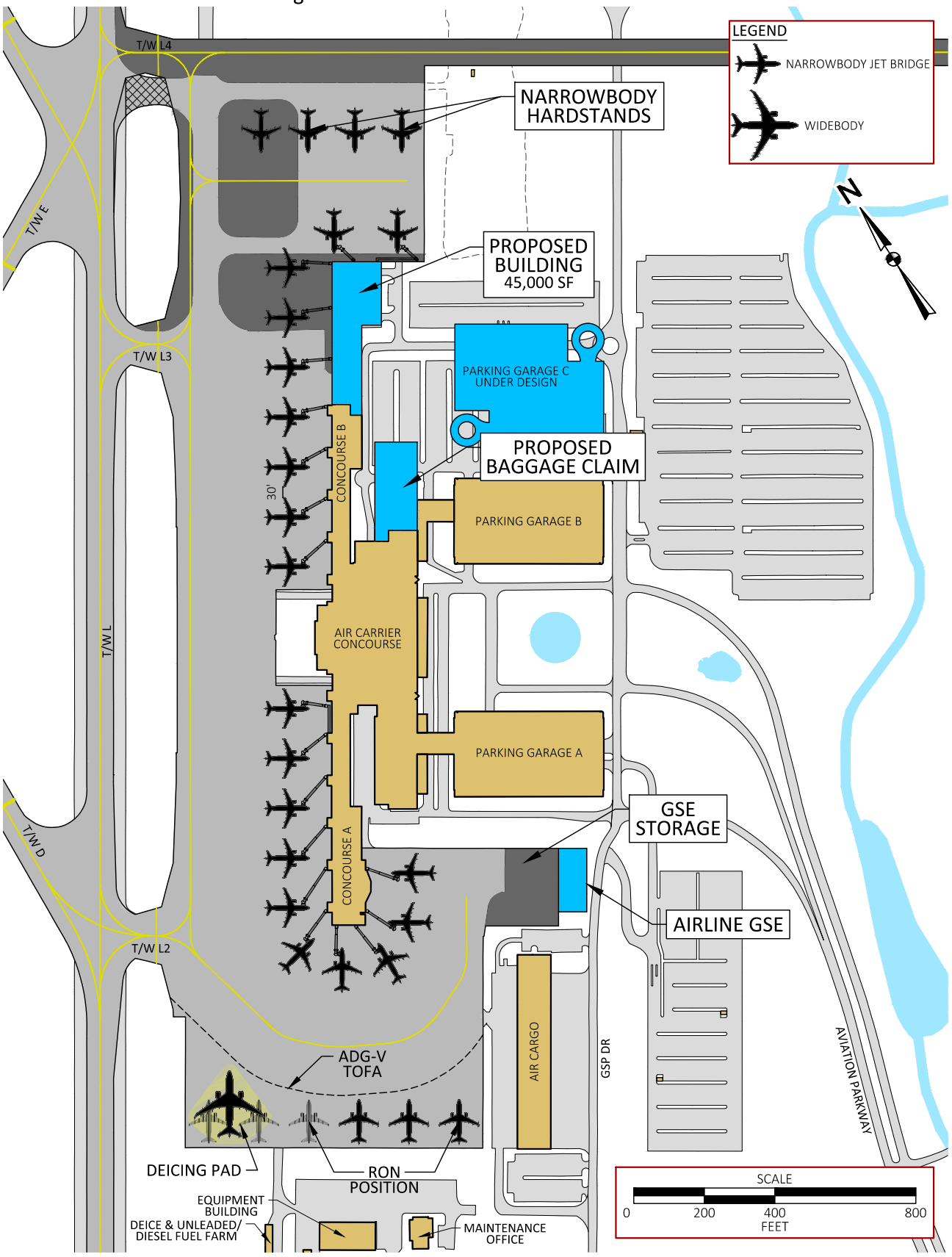
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-70: Refined Terminal Alternative 3



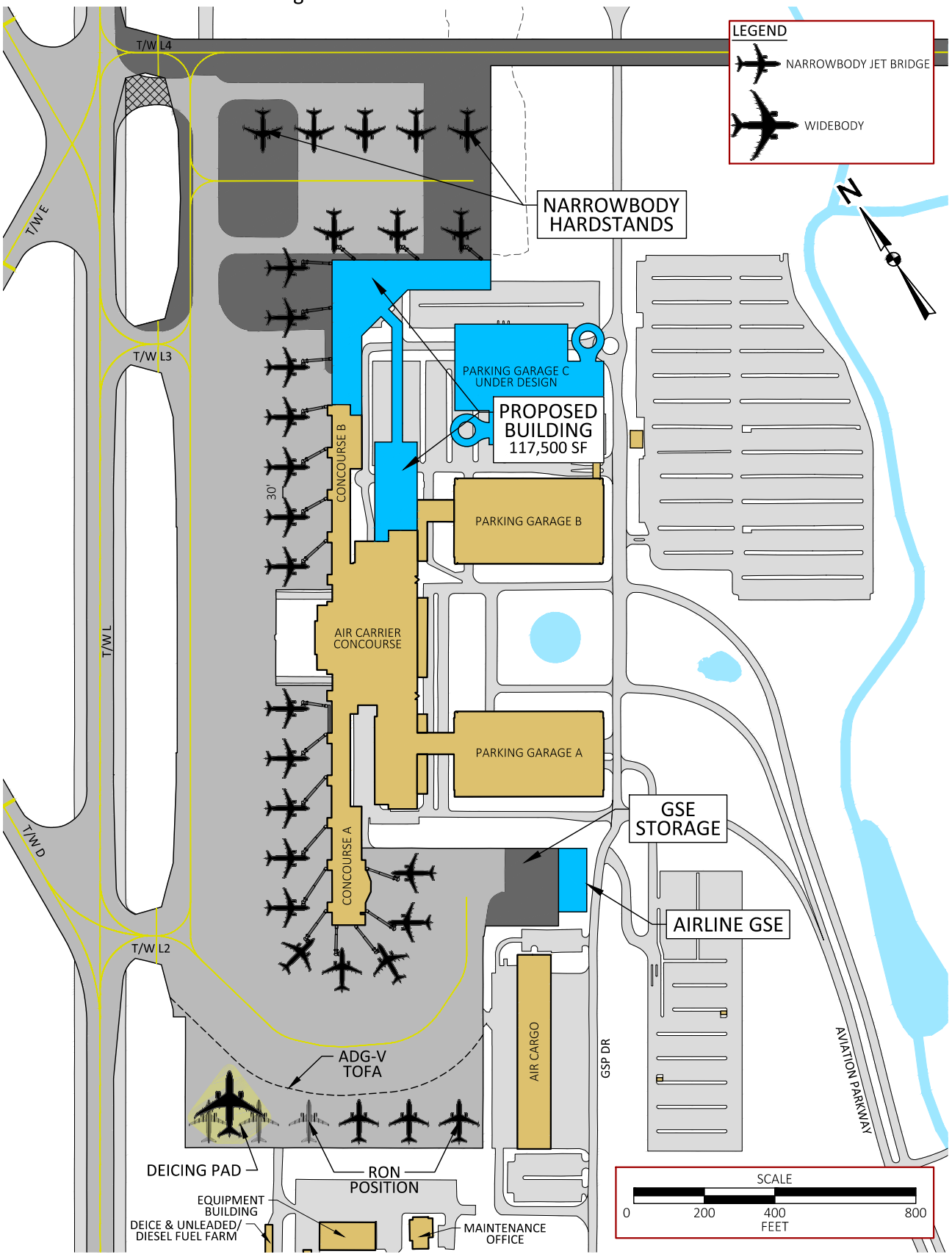
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-71: Refined Terminal Alternative 4



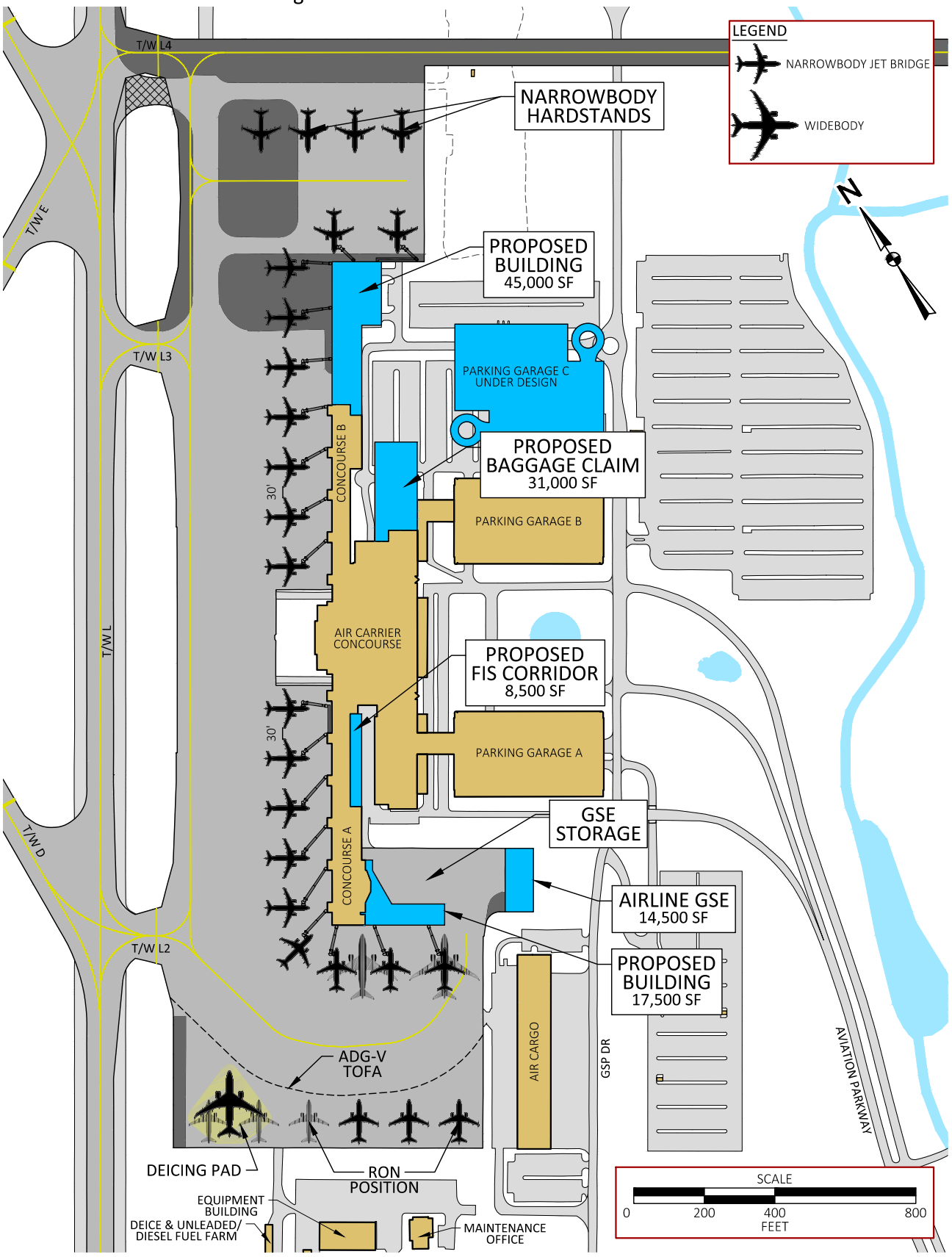
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-72: Refined Terminal Alternative 5



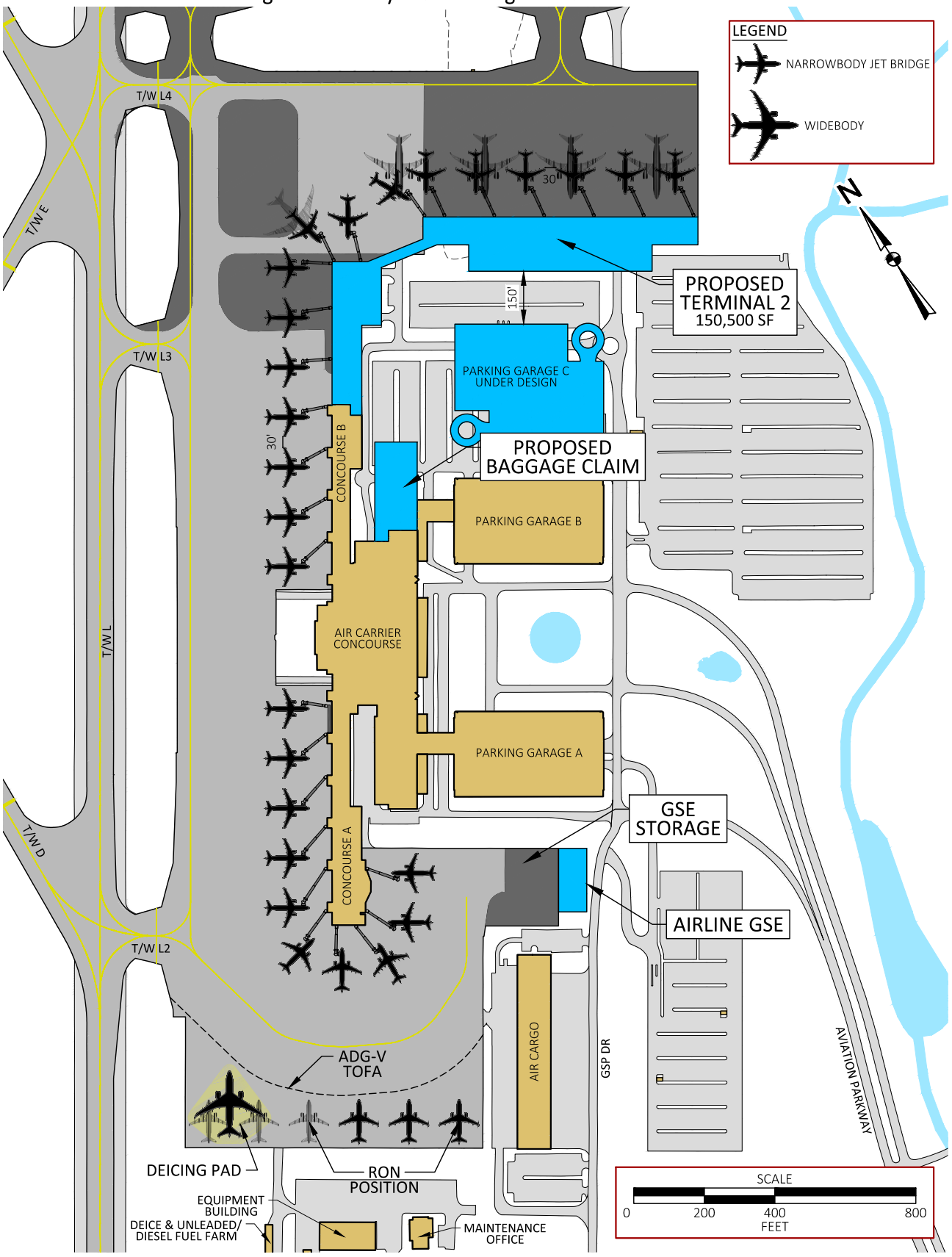
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-73: Refined Terminal Alternative 6



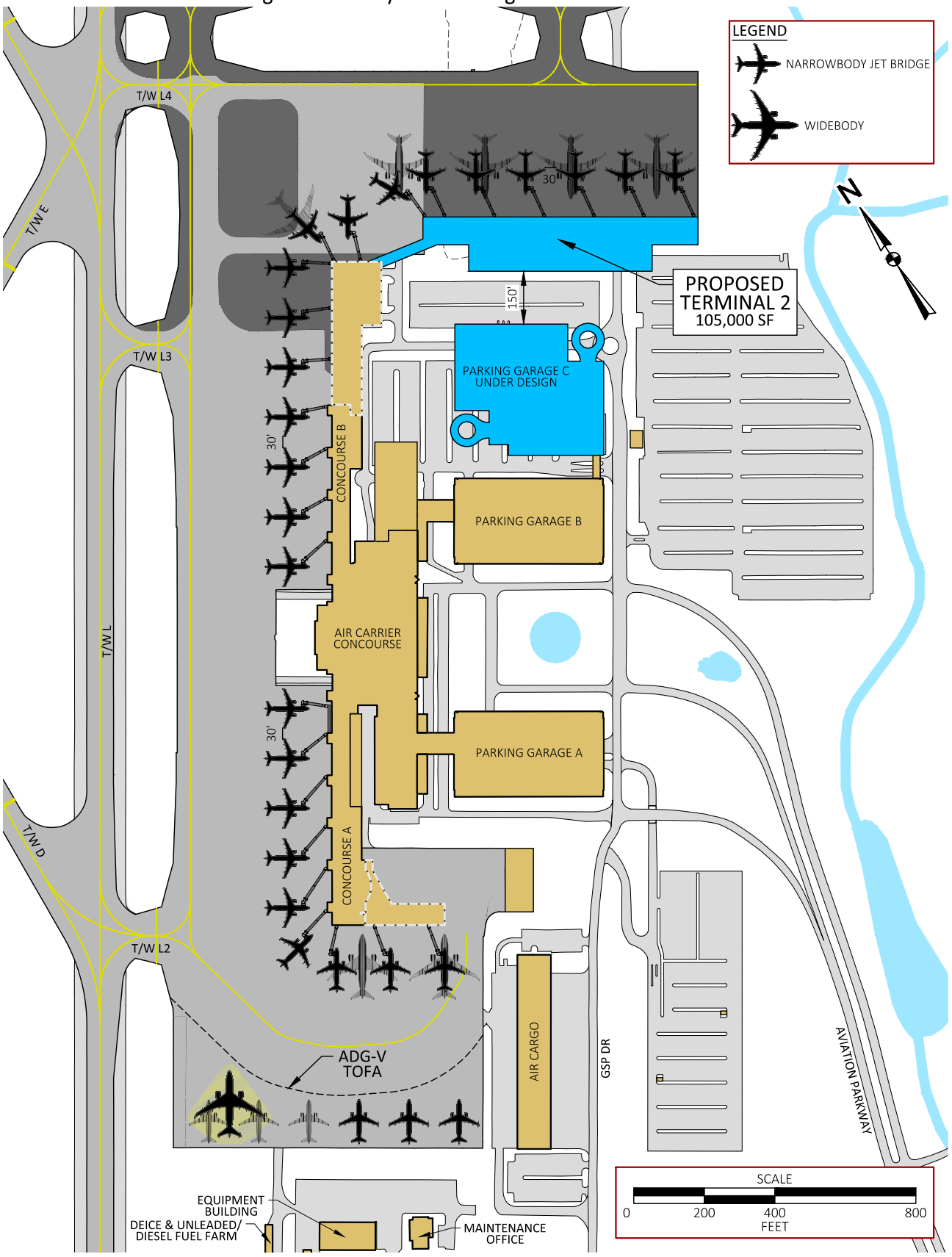
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-74: Beyond Planning Period Alternative 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Figure 6-75: Beyond Planning Period Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-TERMINAL-REFINED.dwg

Evaluation

Through direct engagement with Airport staff and the TAC, the retained and refined terminal airside alternatives were scored using the airfield evaluation criteria previously presented. Terminal airside alternatives were not considered against a no build alternative as the current terminal airside is not equipped to support anticipated future levels of traffic. Additional hardstand and gated aircraft positions will be required to support commercial airline activity in the future. All terminal airside alternatives depict the addition of gated aircraft positions at the two ungated hardstand positions, Gate A0.5 and Gate B4.5. The addition of these gates in the near-term planning period is imperative to support new air carrier entrants to the GSP market forecast during this master plan effort.

Table 6-14 depicts the scoring of the refined terminal airside alternatives and identification of the high scoring alternatives.

Table 6-14: Terminal Airside Alternative Evaluation

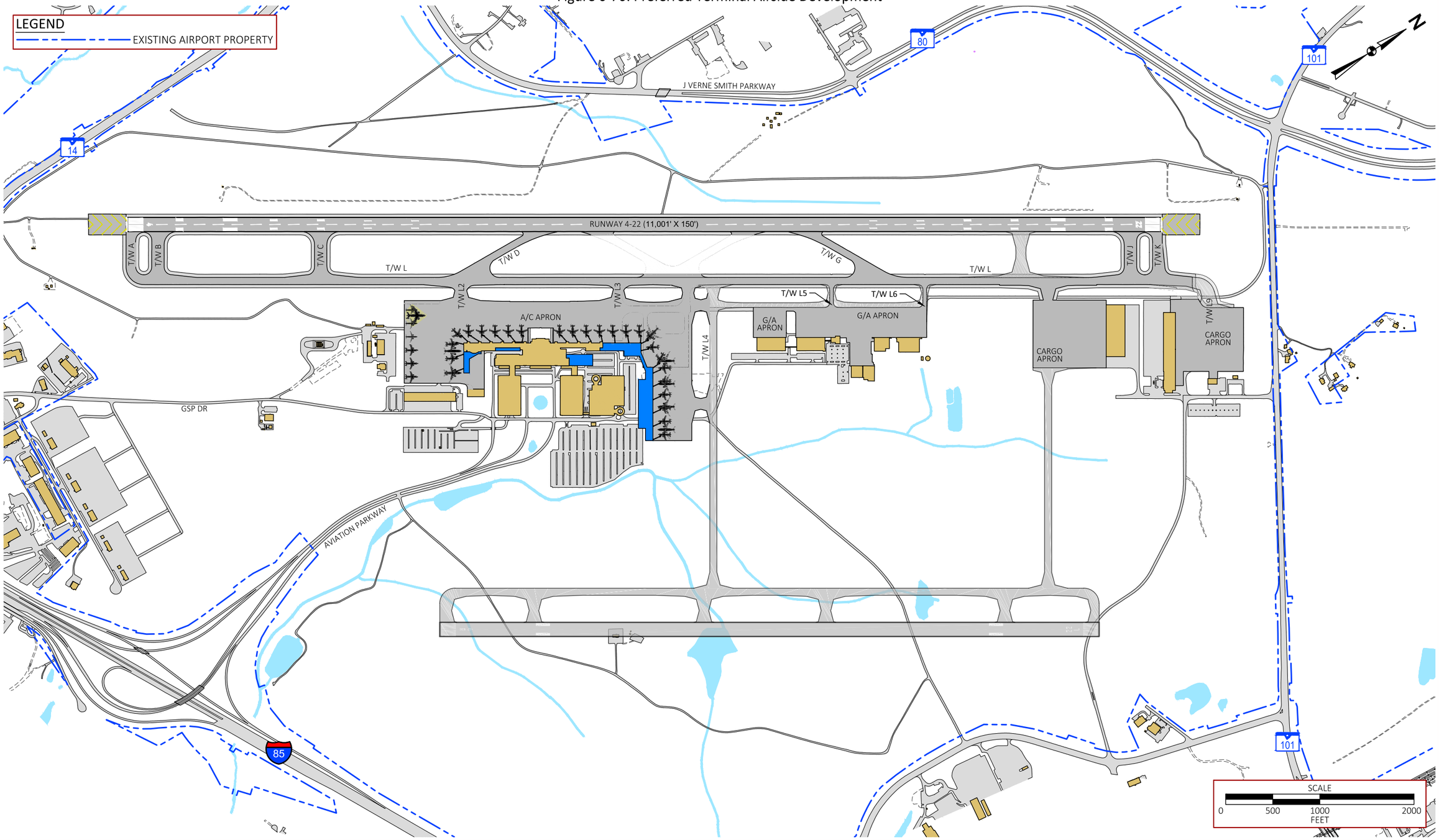
Terminal Airside Alternative	Facility Requirements	Gate Considerations	Environmental Impacts	FAA Standards	Operational Efficiency	Constructability	Development Cost	Balanced Terminal	TOTAL
Refined Terminal Alternative 1	2	0	3	3	3	3	3	2	19
Refined Terminal Alternative 2	2	1	3	3	2	3	2	1	17
Refined Terminal Alternative 3	3	1	3	3	2	2	1	1	16
Refined Terminal Alternative 4	3	2	2	3	3	2	1	3	19
Refined Terminal Alternative 5	3	3	1	3	3	2	1	1	17
Refined Terminal Alternative 6	3	3	2	3	3	2	1	3	20
Beyond Planning Period Alternative 1	3	3	2	3	2	2	2	2	19
Beyond Planning Period Alternative 2	3	3	2	3	3	2	1	3	20

Source: McFarland Johnson, 2018

Refined Terminal Alternative 6 and Beyond Planning Period Alternative 2 were identified as the preferred alternatives for future terminal growth at GSP. Figure 6-76 presents both preferred terminal airside alternatives.

This page has been intentionally left blank.

Figure 6-76: Preferred Terminal Airside Development



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PREFERRED-TERMINAL.dwg

This page has been intentionally left blank.

Landside Access Alternatives

Of the landside access alternatives presented in Section 6.1.3, only two were retained and further refined and one was developed as a new concept as follows:

- **Existing Roads and GA:** Landside Access Alternative 1E, as depicted in **Figure 6-43** was retained and refined to minimize environmental consequences around Dillard Creek, optimize traffic separation, better integrate with Garage C, provide expanded surface parking opportunity and optimize its egress flow. Additionally, a new landside access alternative was developed, Landside Access Alternative 1F, which builds on Landside Access Alternative 1E by blending the GA access road with the future ingress route to the terminal curb loop. This road then splits off prior to the terminal loop road turning west and gaining elevation to meet the future Terminal 2 curb. GA access would be provided underneath the future crossfield taxiway and GA traffic would egress below the terminal loop road before blending back with the terminal loop road entrance lanes and out to the future 2-lane roundabout.

- **New Approach and GA:** Landside Access Alternative 2D was retained and refined to minimize environmental consequences around Dillard Creek, optimize traffic separation, better integrate with Garage C, provide expanded surface parking opportunity, and optimize its egress flow.

These refined landside access alternatives are discussed in **Table 6-15**.

Table 6-15: Retained and Refined Landside Access Alternatives

Focus	Initial Alternative	Refinement	Figure
Existing Roads and GA	Landside Access Alternative 1E	Ingress to terminal splits west of Dillard Creek / Ingress to Garage C revised to separate private vehicle and rental car returns earlier on the access roadways / GA access road realigned / Overflow lot expanded into future surface parking / Egress from expanded overflow parking lot to Aviation Parkway realigned	**Figure 6-77**
	New – Landside Access Alternative 1F	This alternative blends the GA access road with the terminal entrance road before splitting and providing GA access underneath the crossfield taxiway. Egress from GA road to Aviation Parkway would be provided underneath the terminal entrance road as it curves and elevates to become parallel with the future Terminal 2 location.	**Figure 6-78**
New Approach and GA	Landside Access Alternative 2D	GA access road realigned / Entrance lanes to terminal realigned around Dillard Creek / Ingress to terminal splits west of Dillard Creek / Ingress to Garage C revised to	**Figure 6-79**

Focus	Initial Alternative	Refinement	Figure
		separate private vehicles and rental car returns earlier on the access roadways / Expanded surface parking shown / Proposed water features identified	

Source: McFarland Johnson, 2018

The landside access alternatives considered for further evaluation and scoring are depicted in **Figure 6-77** through **Figure 6-79**.

Evaluation

Through direct engagement with Airport staff and the TAC, the landside access alternatives considered herein were scored using the airfield evaluation criteria previously presented. Alternative 2D was dismissed as traffic simulation modeling revealed its inability to maintain a high LOS when considering the anticipated vehicular activity to support three MAEP. Additionally, abandoning useful portions of the existing ingress and egress roadway network to add little capacity does not make fiscal sense. Alternative 1F and 1E were further evaluated and it was found that Alternative 1F provides for a higher LOS through 3 MAEP and better operational efficiency of traffic than Alternative 1E. Furthermore, Alternative 1F is cheaper to construct as a separate roadway dedicated to GA access is not provided. **Table 6-16** details the results of the landside access alternative evaluation.

Table 6-16: Landside Access Alternative Evaluation

Terminal Airside Alternative	Environmental Impacts	Integrity of Aesthetics	Level of Service	Operational Efficiency	Constructability	Development Cost	Future Expansion Potential	TOTAL
Landside Access Alternative 1E	3	3	2	2	3	2	2	17
New – Landside Access Alt 1F	3	3	3	3	3	3	2	20
Landside Access Alternative 2D	1	1	0	2	2	1	3	10
No Build	3	3	0	0	3	3	0	12

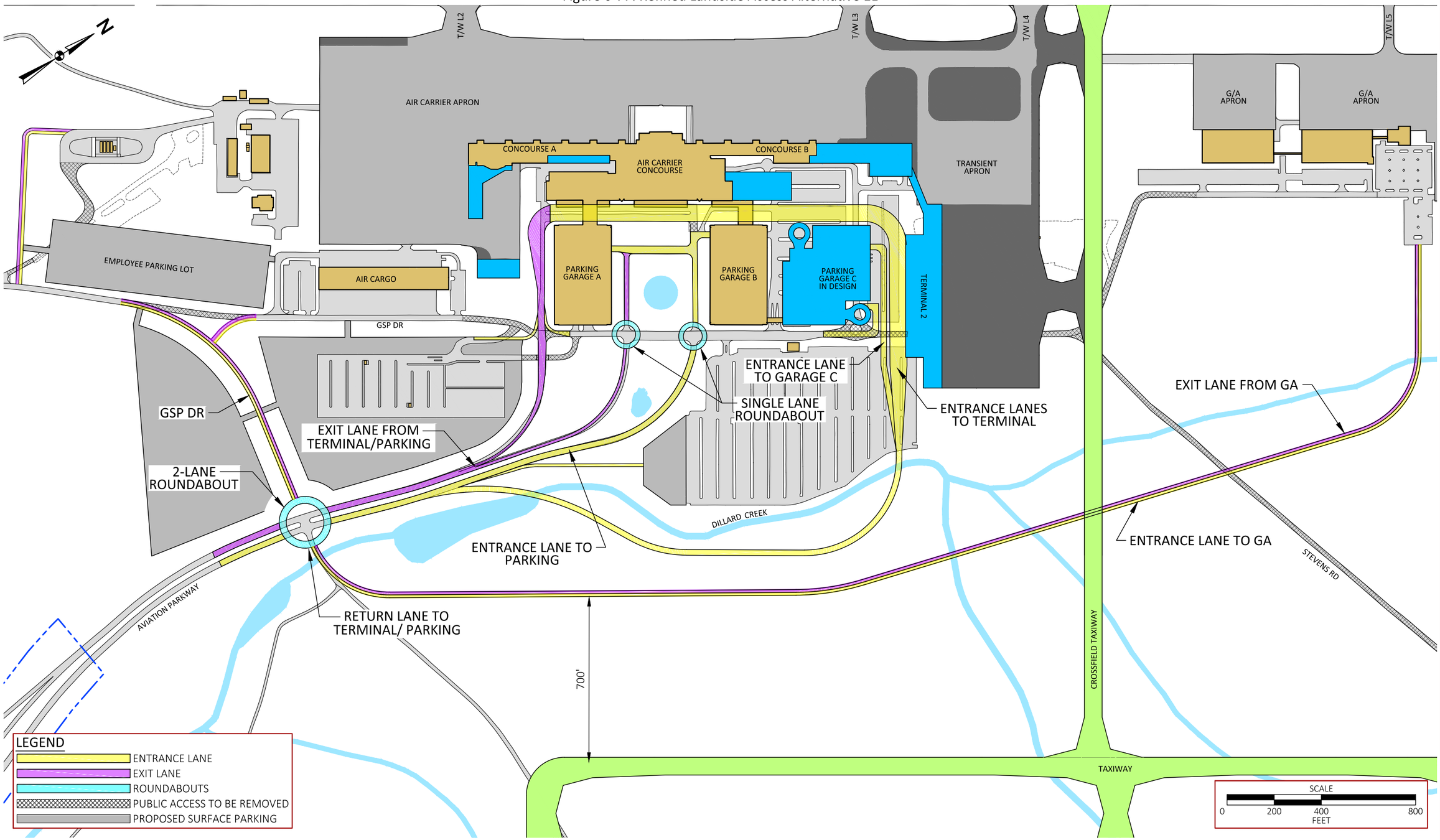
Source: McFarland Johnson, 2018

Landside Access Alternative 1F was identified as the preferred landside access alternative. The following sections focus in on curbside design considerations and opportunities to efficiently connect airport parking facilities with the terminal building.

Curbside Design Alternatives

To maximize the utility and throughput at the terminal curb of the preferred landside access alternative identified above, three lane configurations were explored. **Figure 6-80** through **Figure 6-82** depict the terminal curbside lane configurations explored.

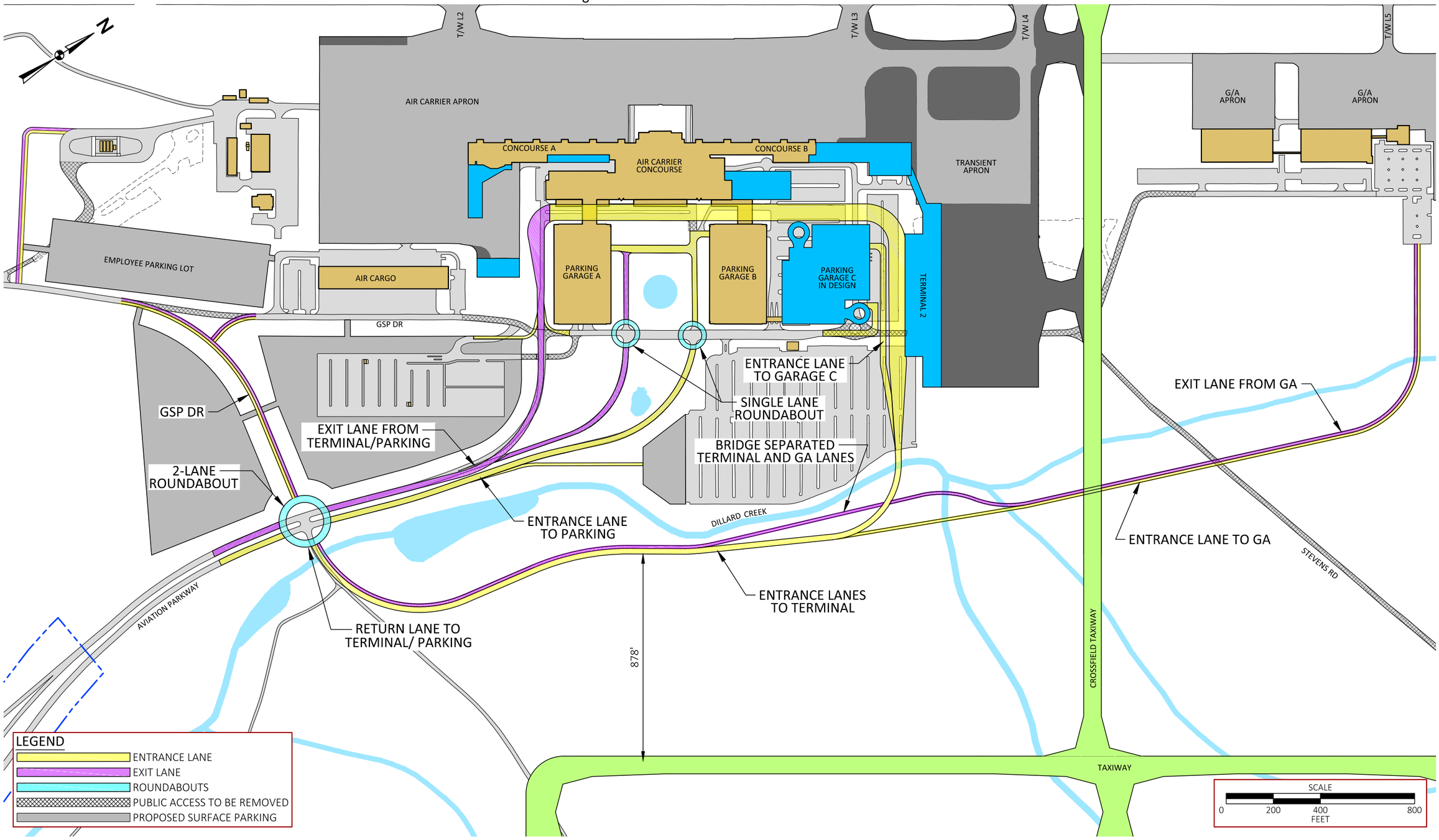
Figure 6-77: Refined Landside Access Alternative 1E



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4alt1.dwg

This page has been intentionally left blank.

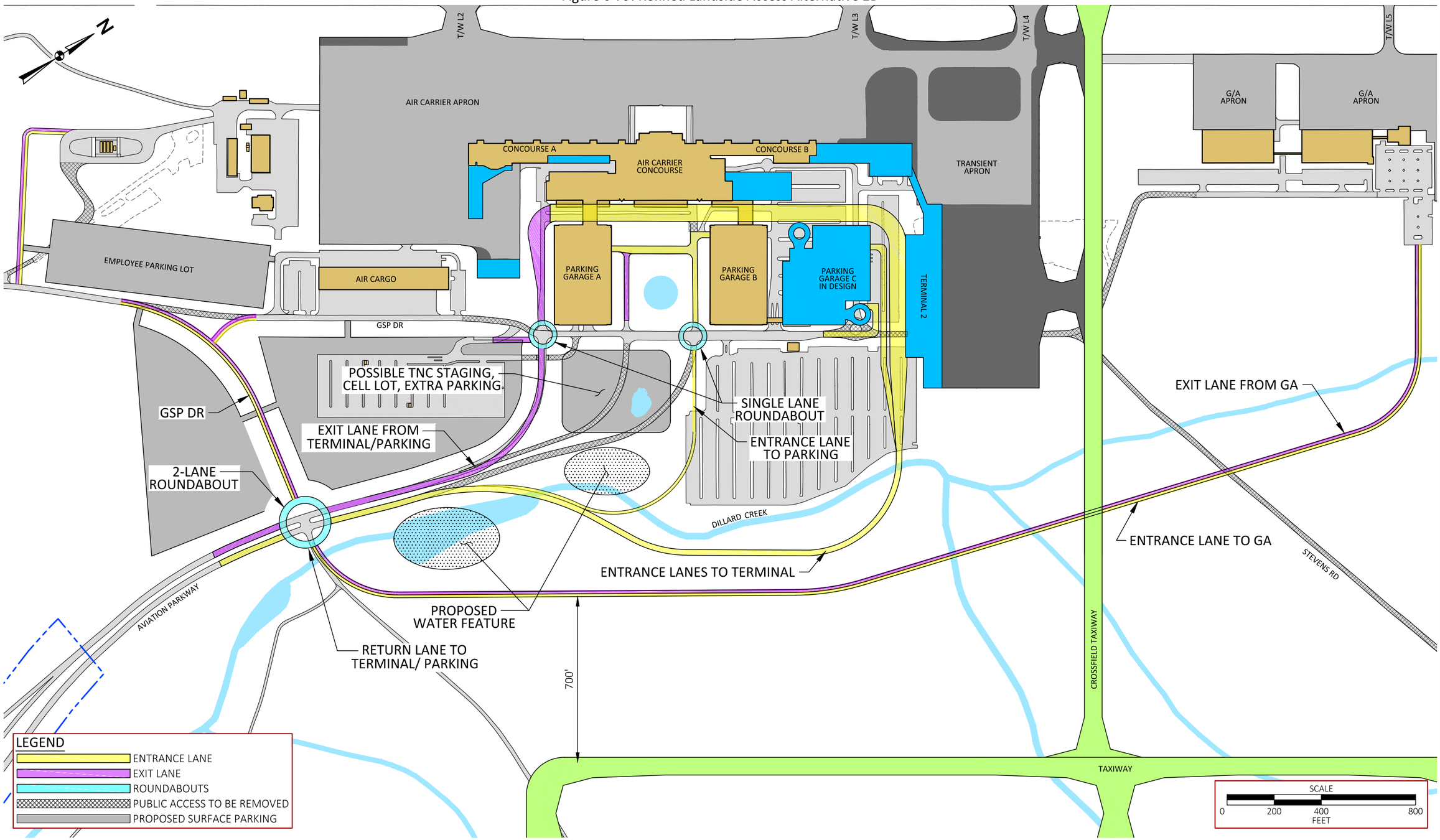
Figure 6-78: New Landside Access Alternative 1F



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4alt2.dwg

This page has been intentionally left blank.

Figure 6-79: Refined Landside Access Alternative 2D



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4alt3.dwg

This page has been intentionally left blank.

- **Inside Loading/Unloading Lanes:** Terminal Lane Alternative 1, presented in **Figure 6-80,** suggests restriping the existing curbside traffic lanes to reflect two passenger loading/unloading lanes against both the terminal curb and the existing pedestrian island such that the passenger side of a car would not open into a vehicle through lane. This would improve safety and traveler expectations.

- **Relocated Pedestrian Island:** Terminal Lane Alternative 2, presented in **Figure 6-81**, suggests relocating the pedestrian island to the east in order to provide two loading/unloading lanes, one maneuvering lane which could also be used as a loading/unloading lane during periods of peak demand, and one through lane. On the other side of the pedestrian island this alternative suggests one loading/unloading land and one through lane. In this alternative, inner lanes closest to the terminal would be reserved for privately owned vehicles while lanes on the outside of the pedestrian island would be for commercial vehicles. This alternative also provides for a bus staging area accessible from the commercial lanes of the terminal loop road and egresses near the existing Garage A entrance.

- **No Pedestrian Island:** Terminal Lane Alternative 3, presented in **Figure 6-82,** suggests removing the pedestrian island entirely and providing three loading/unloading lanes, one maneuvering land, and two through lanes.

The preferred curbside layout is Terminal Lane Alternative 1 in the short-term with a phased approach to Terminal Lane Alternative 2 in the long-term.

Personal Rapid Transit Considerations

Airports around the world are realizing new opportunities to solve airport-related transportation problems using personal rapid transit and group rapid transit (PRT/GRT) systems compared to the traditional shuttle bus model to connect passenger access across the terminal campus. To provide seamless connectivity between all future surface parking lots and terminals at GSP in the future, multiple PRT/GRT track alignments were developed. The dedicated track or guideways considered are shown in **Figure 6-83** through **Figure 6-85**, while **Figure 6-86** explores a semi-integrated route where PRT vehicles would share personal vehicle lanes within parking lots and at the terminal curb.

- **Original Concept:** PRT Alignment Alternative 1, presented in **Figure 6-83**, shows the original working concept for PRT at GSP which would provide surface pick-up and drop-off stations inside Economy Lot A to connect passengers to and from the northside of the terminal's non-secure wing via an elevated guideway.

- **Expanded Original:** PRT Alignment Alternative 2, presented in **Figure 6-84**, expands on PRT Alignment Alternative 1 by expanding dedicated tracks to integrate proposed surface lots on the south side of Aviation Parkway via an elevated guideway. In addition, PRT Alignment Alternative 2 includes consideration for Terminal 2 by offering a pick-up and drop-off station on the west side of its core. This alternative allows for potential multi-modal connections to the Greenville Downtown area or any development within Tract G of the Airport's property.

- **Full Loop:** PRT Alignment Alternative 3, presented in Figure 6-85, explores the ability to provide a full loop from the outer edges of each surface lot and all terminals in the future with two in-terminal stations for each terminal. Under this concept, elevated guideways would be required to traverse terminal top spaces and provide vertical circulation from terminal-top PRT stations to the terminal.

- **Shared Roadway:** PRT Alignment Alternative 4, presented in Figure 6-86, presumes dedicated tracks will not be required for PRT systems at GSP in the future and that PRT vehicles would be capable of sharing the roadway with other vehicles and with pedestrians in slow-speed surface lot areas. Below-grade crossings of major arterial roads within the terminal landside access network are proposed for PRT routes to maintain continual traffic flow on these roadways. This alternative presents two possible alignment options that are not mutually exclusive. One track alignment would require an elevated guideway between Garage B and C to access a PRT station near the terminal, while the other track would be developed at-grade and utilize mostly existing paved surfaces.

PRT/GRT Feasibility

The feasibility of PRT/GRT compared to shuttle bus operation is a function of initial capital costs plus operational costs of each system compared over time. Though it is expected that a PRT/GRT system would provide a more enjoyable experience and higher level of service for users, the high initial capital costs and relatively low operating costs of this system should be weighed against the low capital costs and relatively high operating costs of a bus system to determine how long it would take for one system to be less costly than the other.

Current shuttle bus operations require an upfront capital cost of approximately $105,000 with annual operating costs of $250,000 per bus. This includes the capital costs for bus shelters at the various existing and proposed lots and the operating costs associated with leasing the buses and fuel. Using a ratio of buses in service today and current parking demand it was determined that five busses will be needed by 2025 with incremental increases in line with enplanement growth. Assuming a PRT/GRT system would be implemented once the Airport has constructed proposed surface lots, when it would be most useful, six buses would be in operation. At this point, which is estimated to be in 2025, three additional bus shelters would need to be built at a cost of $35,000 each. From 2025 to 2035, the Airport it is estimated that the Airport will have spent $16.1 million on the bus system, including capital and operating costs.

PRT/GRT systems can vary in their initial capital cost but are generally much cheaper to operate than busses, resulting in lower life-cycle cost. The capital costs for the PRT/GRT system would include retrofitting the existing bus shelters in 2025 and building three new PRT/GRT stations. In addition, the cost of infrastructure including tunnels and curb-style tracks is included in the capital cost estimates. PRT/GRT vehicles cost approximately $350,00 each and incur an annual operating cost of about $60,000. Assuming the demand for carriages reflects the same seating capacity provided by the bus system to meet enplanement growth, 11 carriages would be needed in 2025. From 2025 to 2035, it is estimated that the Airport will have spent between $15.4 and $16 million for Options 1 and 2 of Alternative 4, respectively.

Based on assumptions for initial capital costs and operating costs of bus and PRT/GRT systems, it is estimated that a PRT/GRT would cost less after 11 years of operation.

Figure 6-80: Terminal Curbside Lane Configuration Alternative 1

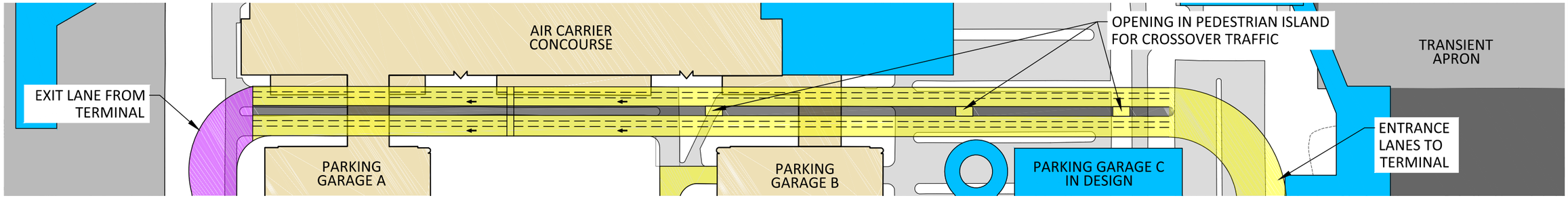
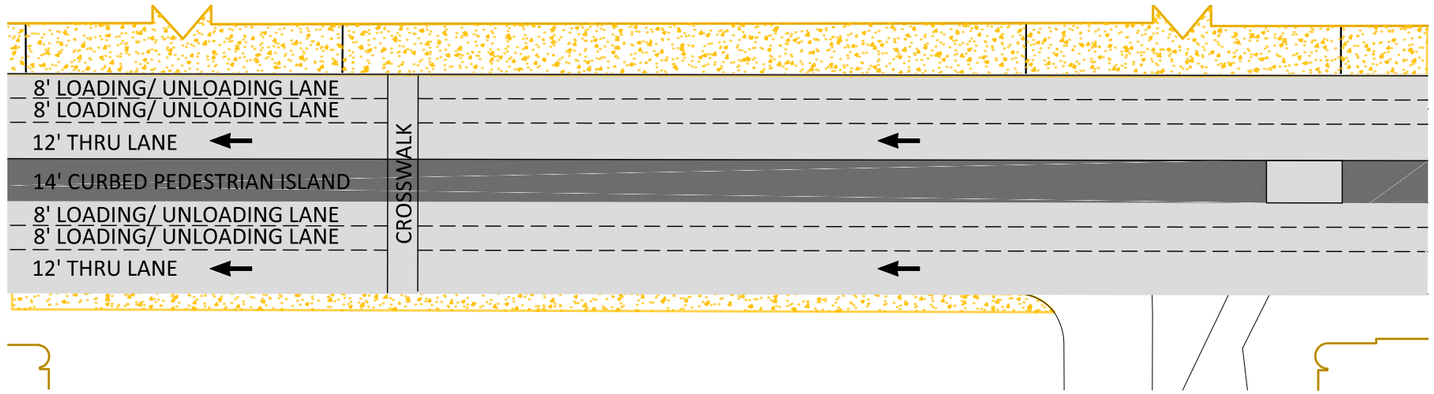
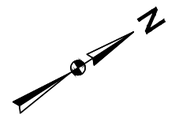
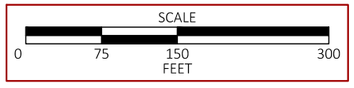


Figure 6-80: Terminal Curbside Lane Configuration Alternative 1







K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4curbalt1.dwg

This page has been intentionally left blank.

Figure 6-81: Terminal Curbside Lane Configuration Alternative 2

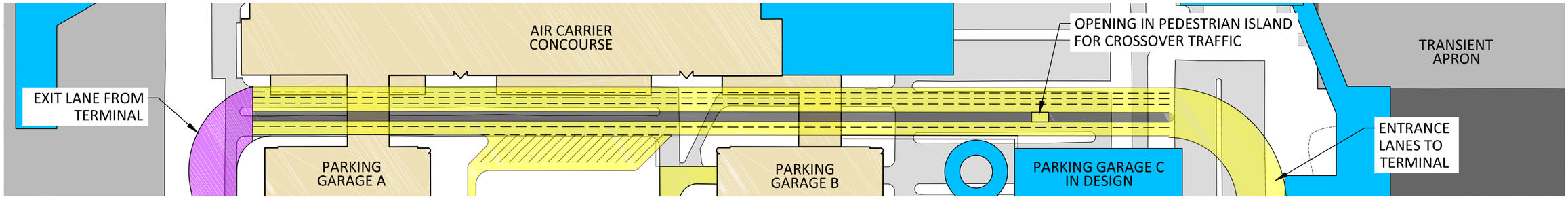
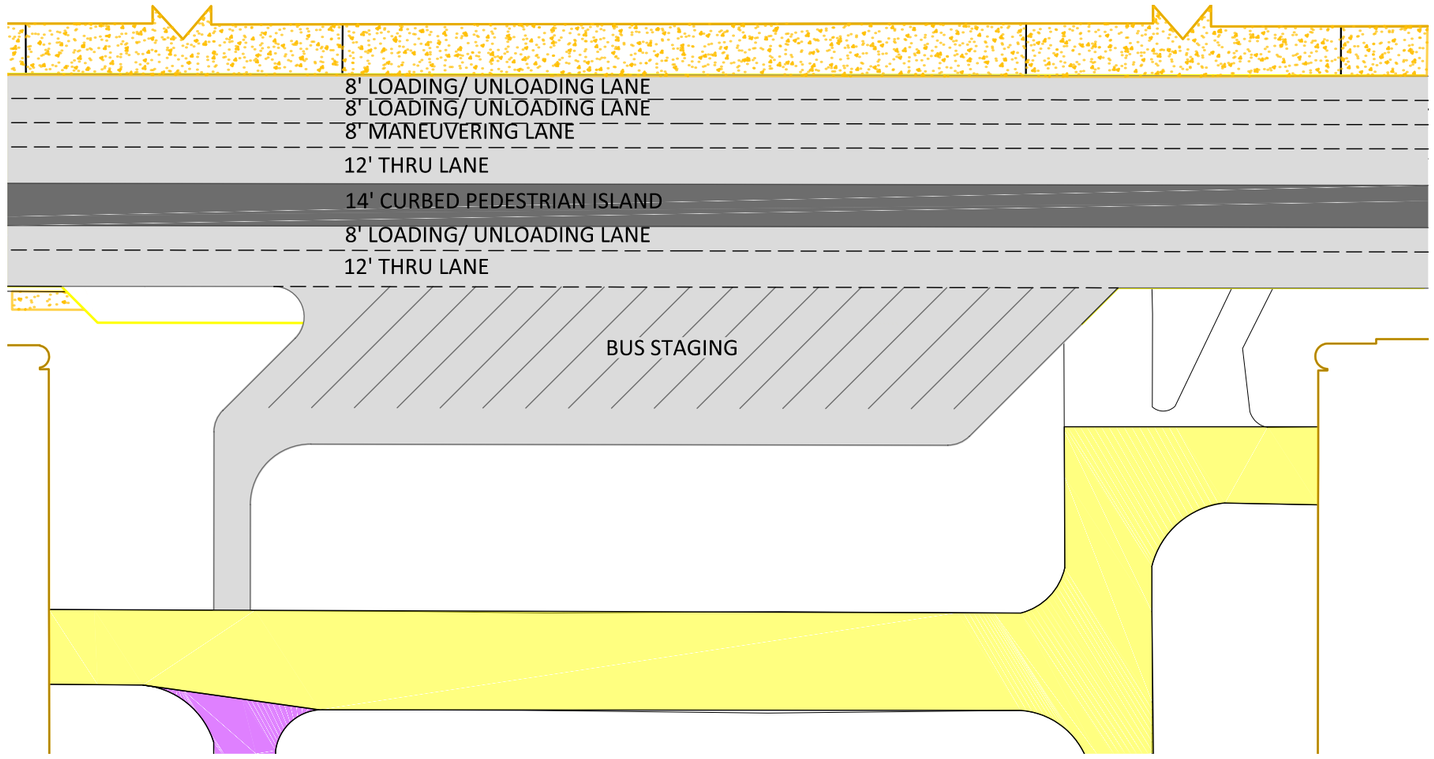


Figure 6-81: Terminal Curbside Lane Configuration Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4curbalt1.dwg

This page has been intentionally left blank.

Figure 6-82: Terminal Curbside Lane Configuration Alternative 3

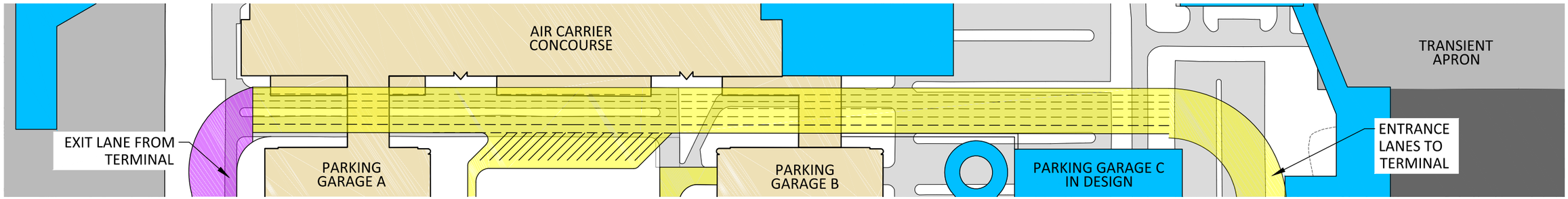
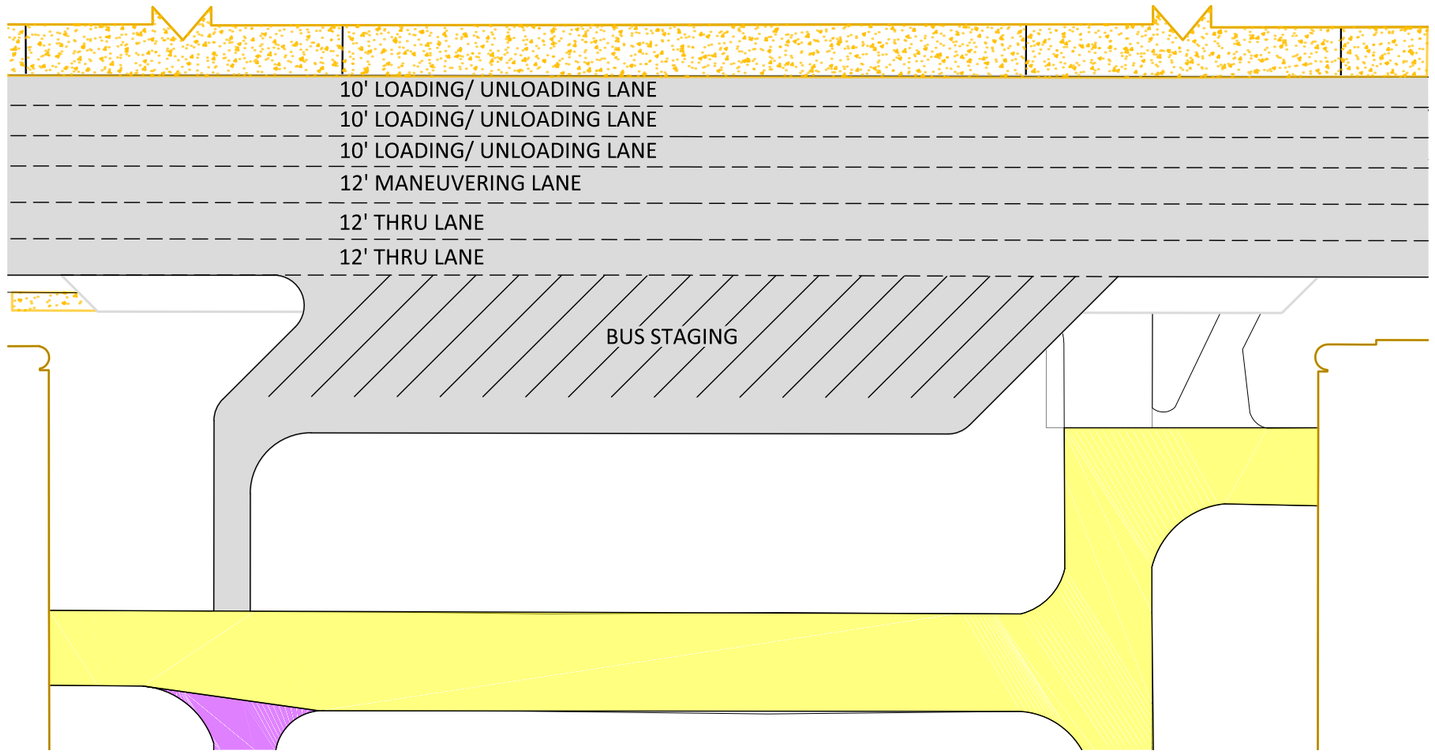


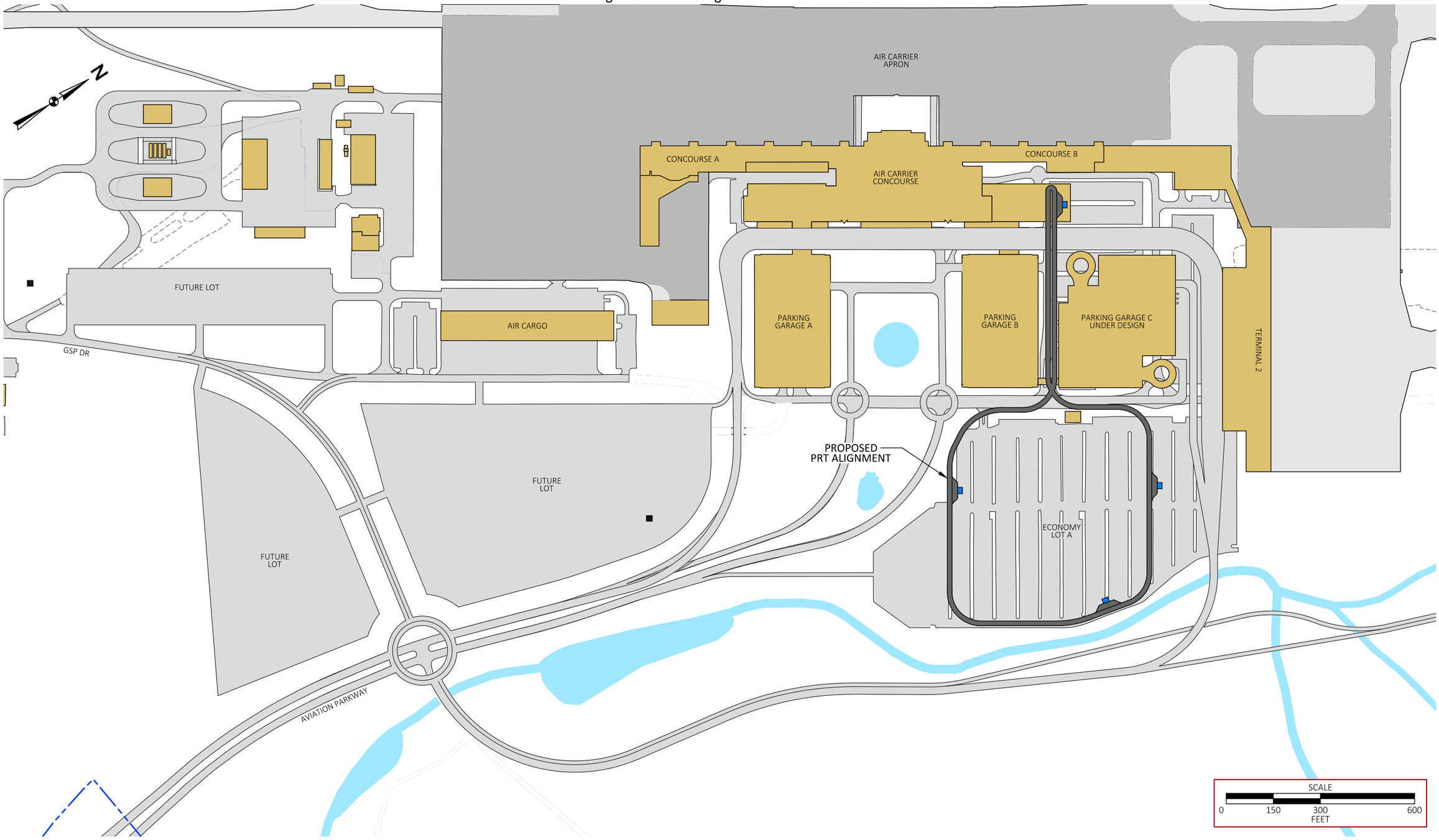
Figure 6-82: Terminal Curbside Lane Configuration Alternative 3



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-ROADWAY 4curbalt1.dwg

This page has been intentionally left blank.

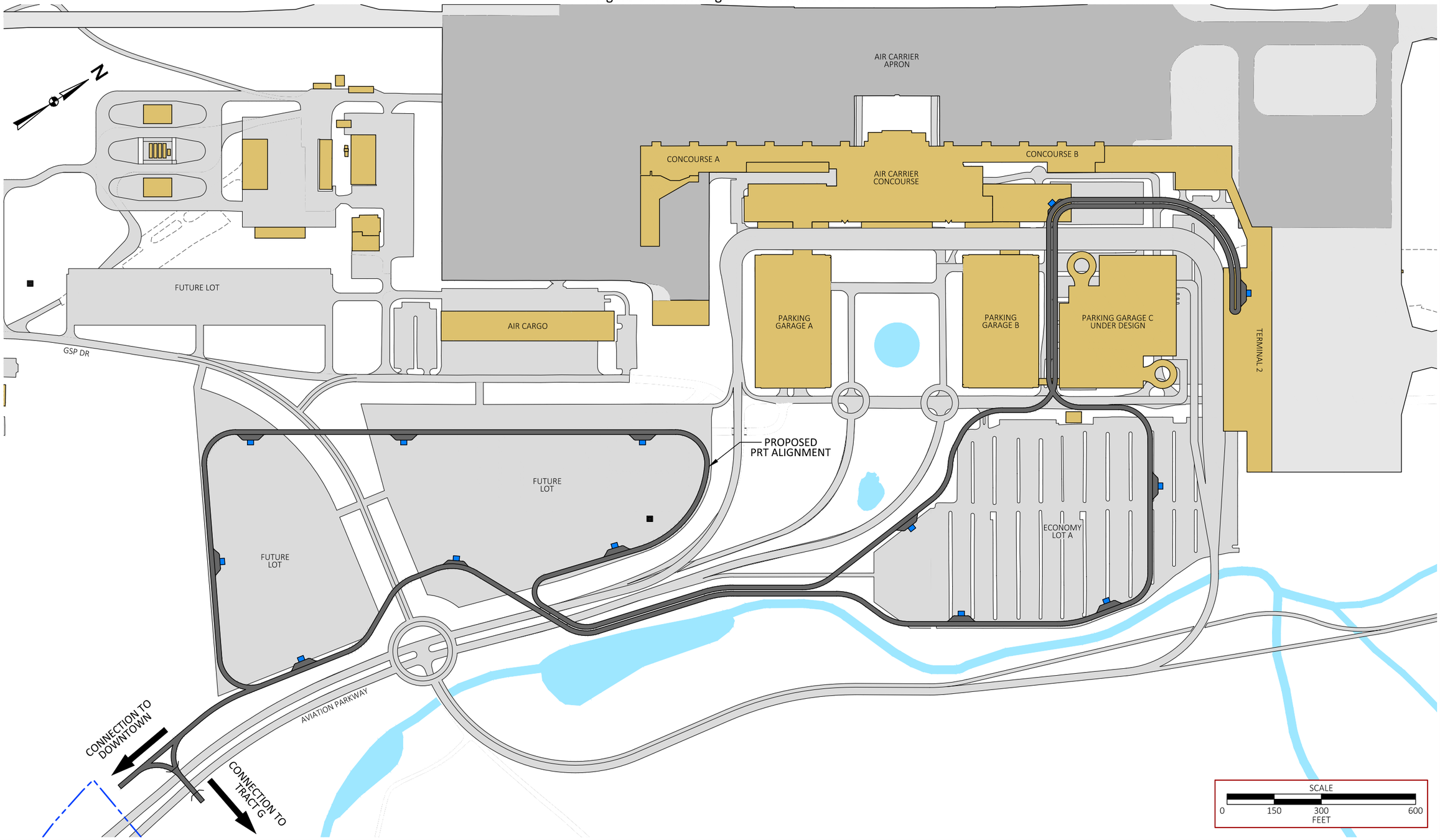
Figure 6-83: PRT Alignment Alternative 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PRT.dwg

This page has been intentionally left blank.

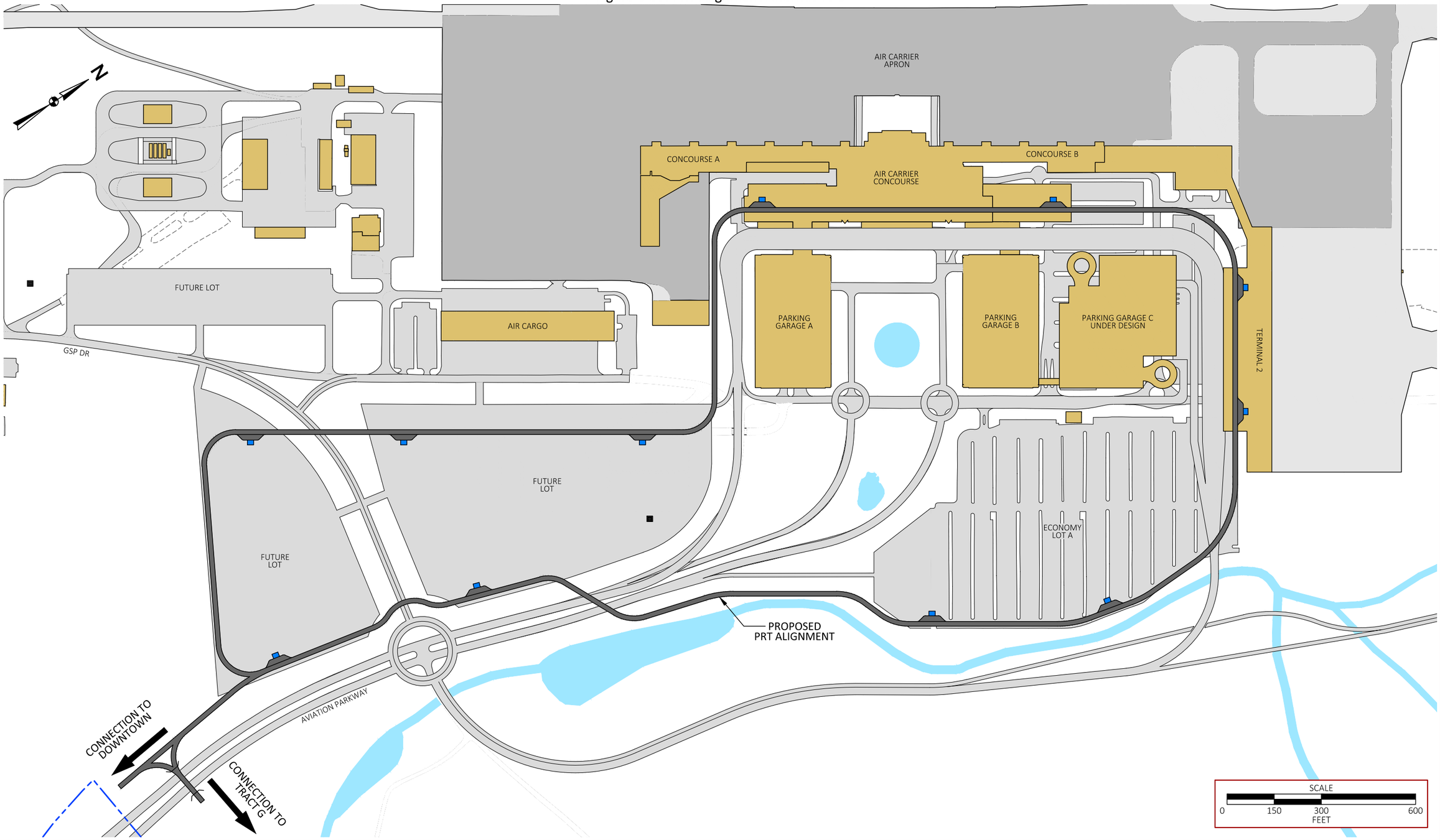
Figure 6-84: PRT Alignment Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PRT.dwg

This page has been intentionally left blank.

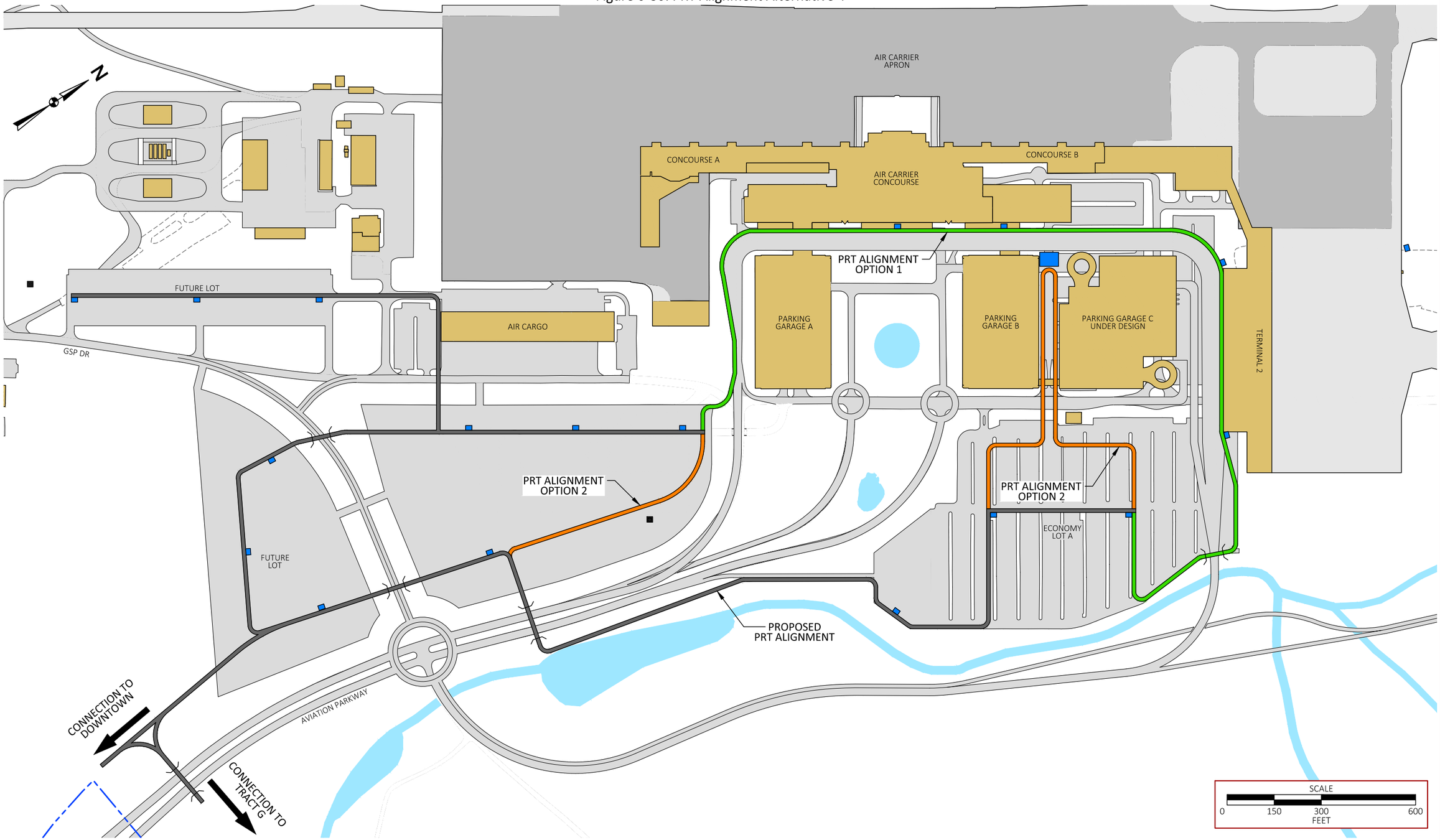
Figure 6-85: PRT Alignment Alternative 3



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PRT.dwg

This page has been intentionally left blank.

Figure 6-86: PRT Alignment Alternative 4



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PRT.dwg

This page has been intentionally left blank.

Air Cargo Facility Alternatives

Of the air cargo development alternatives presented in Section 6.1.4, only the alternative with the greatest capacity was retained, as identified in **Table 6-17** and presented in **Figure 6-87**.

Table 6-17: Retained and Refined Air Cargo Facility Alternatives

Focus	Initial Alternatives	Refinement	Figure
Air Cargo Expansion	Air Cargo Alternative 3	Optimized taxiway bridge to work with existing terrain / Expanded existing north cargo apron to the east	**Figure 6-87**

Source: McFarland Johnson, 2018

General Aviation Facility Alternatives

Of the GA development alternatives presented in Section 6.1.5, only the alternative providing ADG III setbacks throughout the GA development area was retained and refined as presented in **Table 6-18**. This alternative will provide considerable flexibility in the ability of GSP to service the needs of a variety of aircraft types across its GA campus.

As the national GA fleet shifts away from piston driven aircraft and more towards jet aircraft and GSP continues to communicate the appeal of the Airport to the business aviation community, it is prudent to plan for an expanded GA development area capable of supporting a variety of large business jet aircraft.

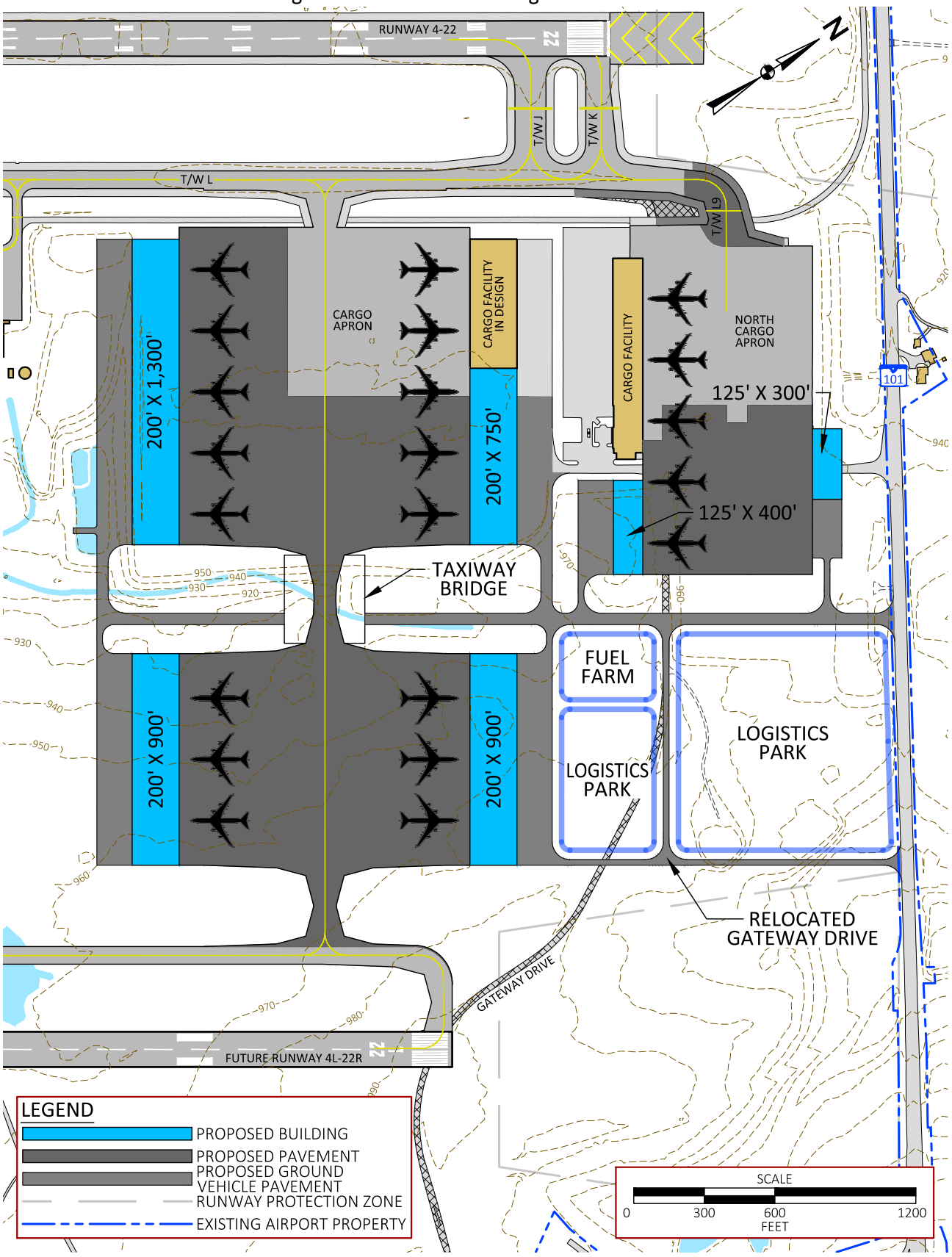
Table 6-18: Retained and Refined General Aviation Facility Alternatives

Focus	Initial Alternatives	Refinement	Figure
ADG III Design	GA Development Area Alt. 1	Optimized to better integrate with air cargo expansion area as well as the proposed crossfield taxiway.	**Figure 6-88**

Source: McFarland Johnson, 2018

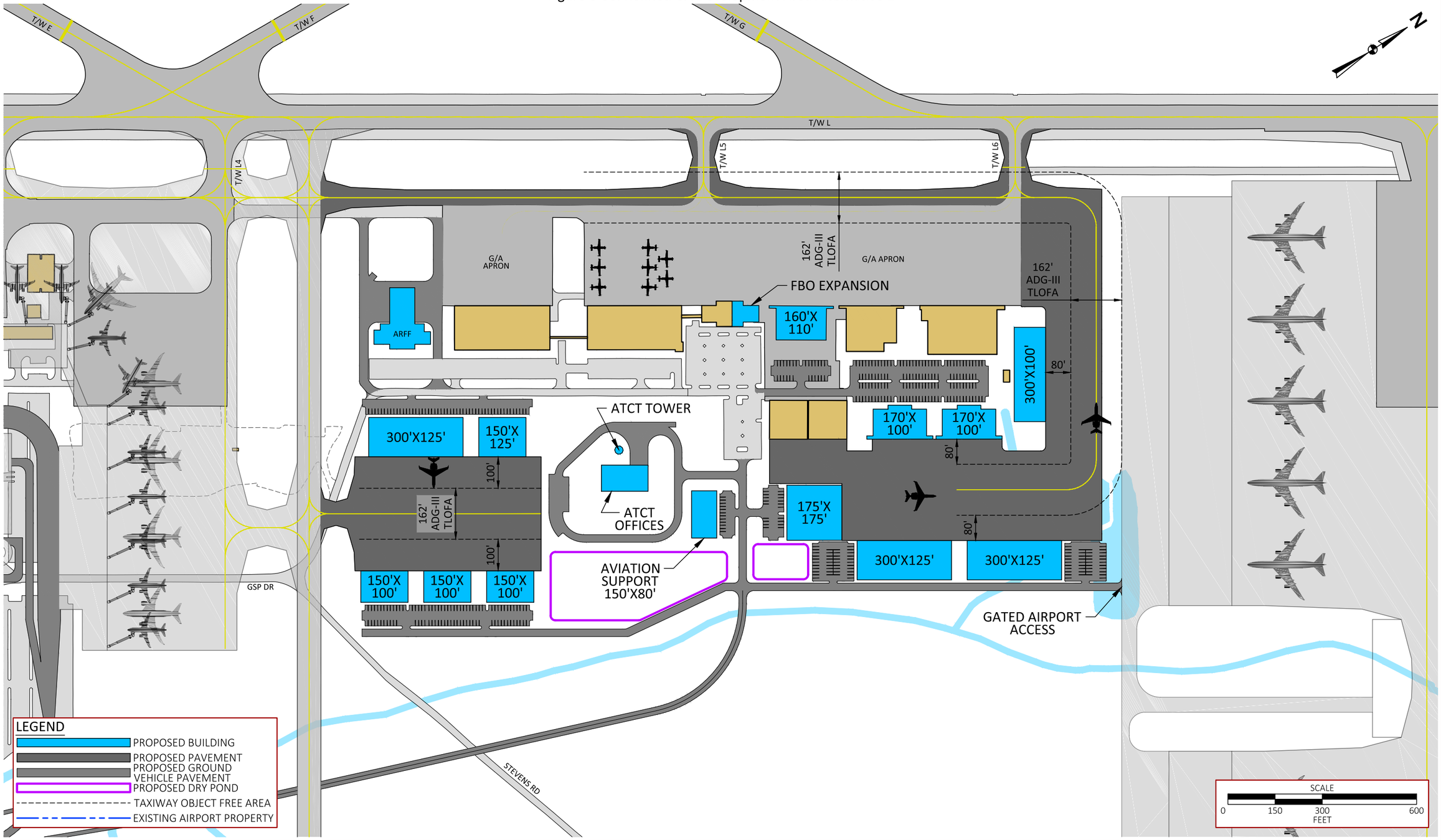
Figure 6-88 presents the refined GA development area alternative.

Figure 6-87: Refined Air Cargo Alternative 3



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-CARGO-REFINED.dwg

Figure 6-88: Refined GA Development Area Alternative 1



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA-REFINED.dwg

This page has been intentionally left blank.

Other Aviation Development Properties

West Side Aviation Development

Although westside properties are long-term in nature, significant opportunity exists to provide for aviation uses in this area. Table 6-19 presents the retained westside development alternative and discusses its refinement.

Table 6-19: Retained and Refined Westside Aviation Alternatives

Focus	Initial Alternatives	Refinement	Figure
MRO/Air Cargo Development Opportunities	West Side Aviation Area Alt. 2	Identified aviation support areas / Identified aviation fuel farm / Optimized building sizes and parking based on storm water considerations	Figure 6-89

Source: McFarland Johnson, 2018

Figure 6-89 presented the retained westside development area alternative.

Southside Aviation Development

The southside aviation development alternative presented in Figure 6-59 was retained but not refined for further consideration. Cursory engineering analysis identified that only the ingress/egress route presented in the alternative would meet grade requirements. Alternatives to raise the site elevation to runway grade were not explored.

Support Facility Requirements

Elements of each of the support facility development alternatives presented in Section 6.1.7 were utilized in development of the preferred support facility development presented in Figure 6-90 which presents the preferred fuel farm and maintenance apron expansion. After full refinement of alternatives, a new location for a GRE was identified adjacent to the proposed taxilane for the southside aviation development area. This reflects the preference of airport stakeholders while meeting facility requirements.

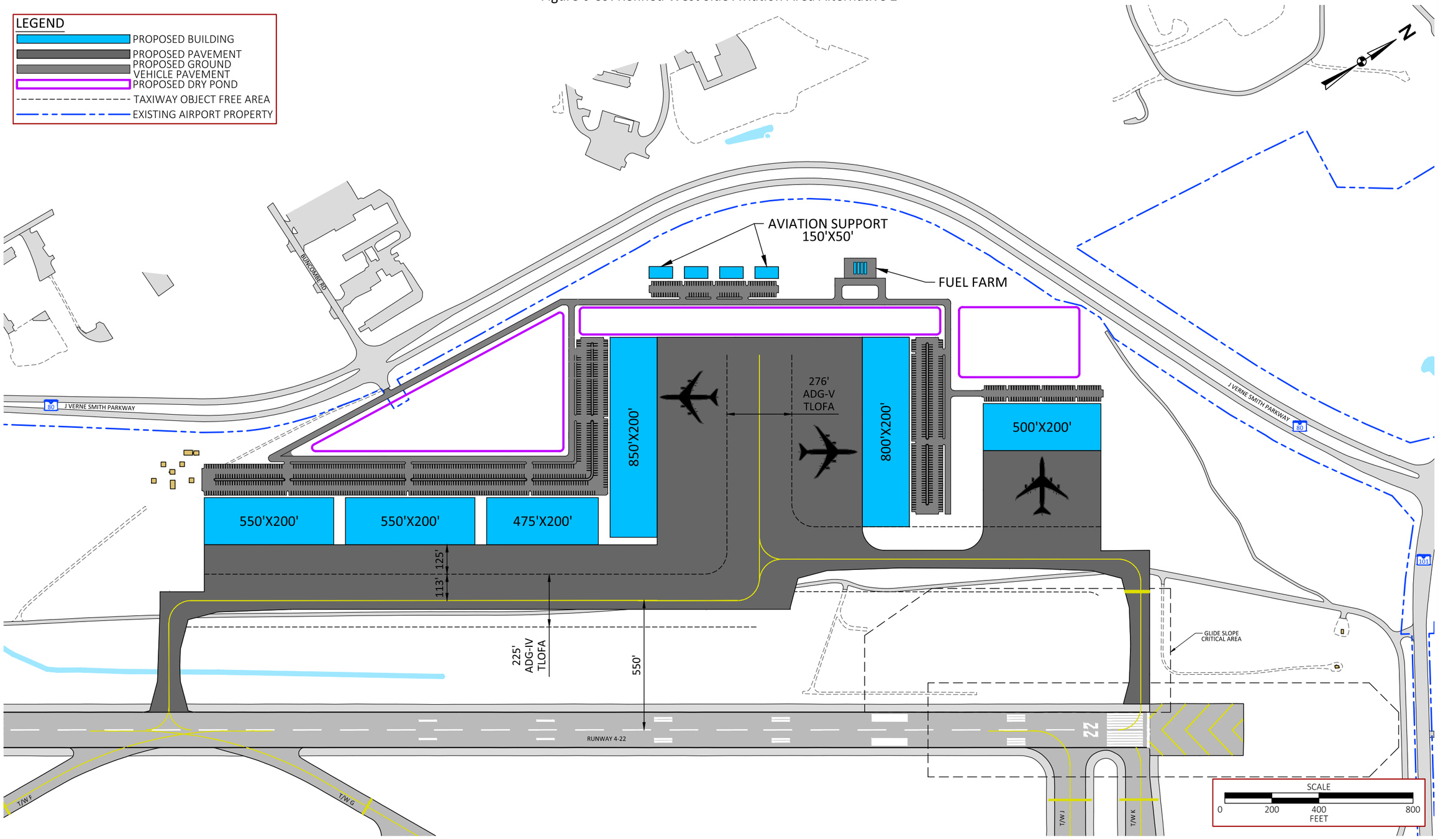
6.2.3. Non-Aviation Land Use Considerations

The Airport's Master Land Use Plan completed in 2013 identifies a variety of Airport lands not intended to be reserved for aviation use purposes. These properties were recommended for such uses as retail, hospitality, industrial, light industrial, service, and flexible uses. These properties were identified for such non-aviation activities because they are non-contiguous with airfield properties, not at grade with the airfield, and/or are not anticipated to be required to support future aviation demand.

Utilizing the 2013 Master Land Use Plan as a starting point, Figure 6-91 depicts an updated map of non-aviation use properties at GSP compatible with the future development goals previously identified and the existing Airport property boundary.

This page has been intentionally left blank.

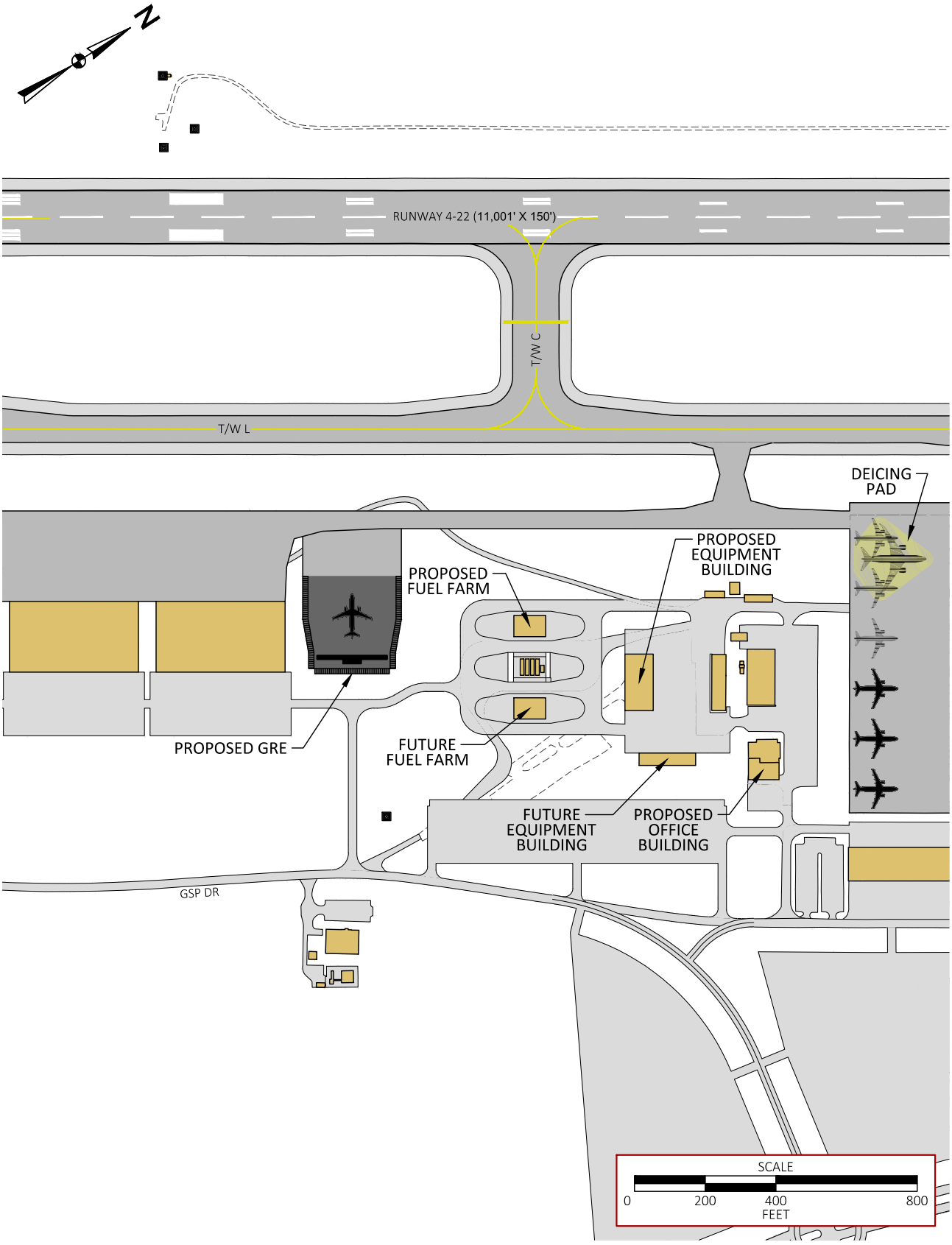
Figure 6-89: Refined West Side Aviation Area Alternative 2



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-GA-REFINED.dwg

This page has been intentionally left blank.

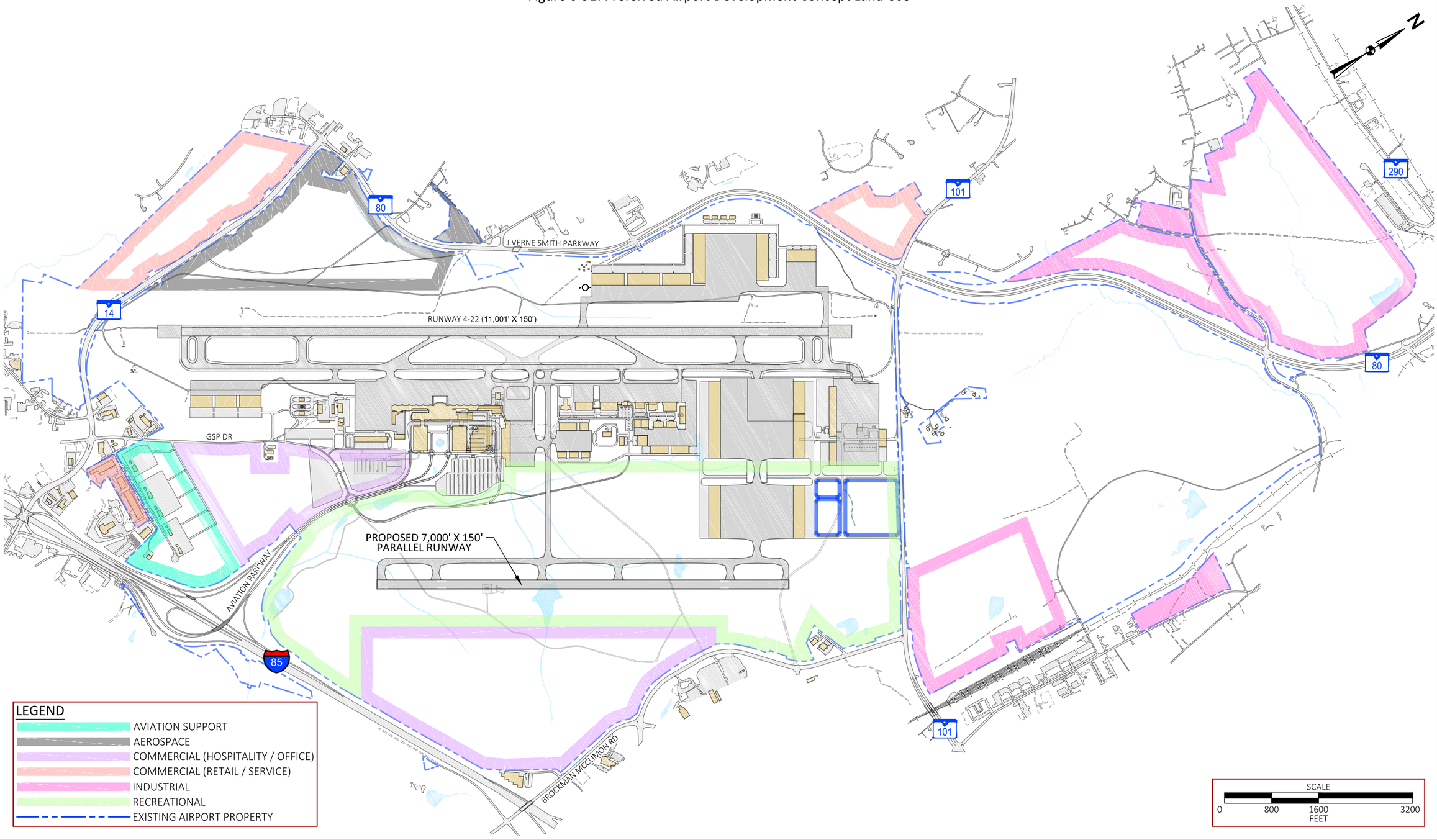
Figure 6-90: Preferred Support Facility Development and GRE Considerations



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PREFERRED-SUPPORT.dwg

This page has been intentionally left blank.

Figure 6-91: Preferred Airport Development Concept Land Use



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PREFERRED-LAND USE.dwg

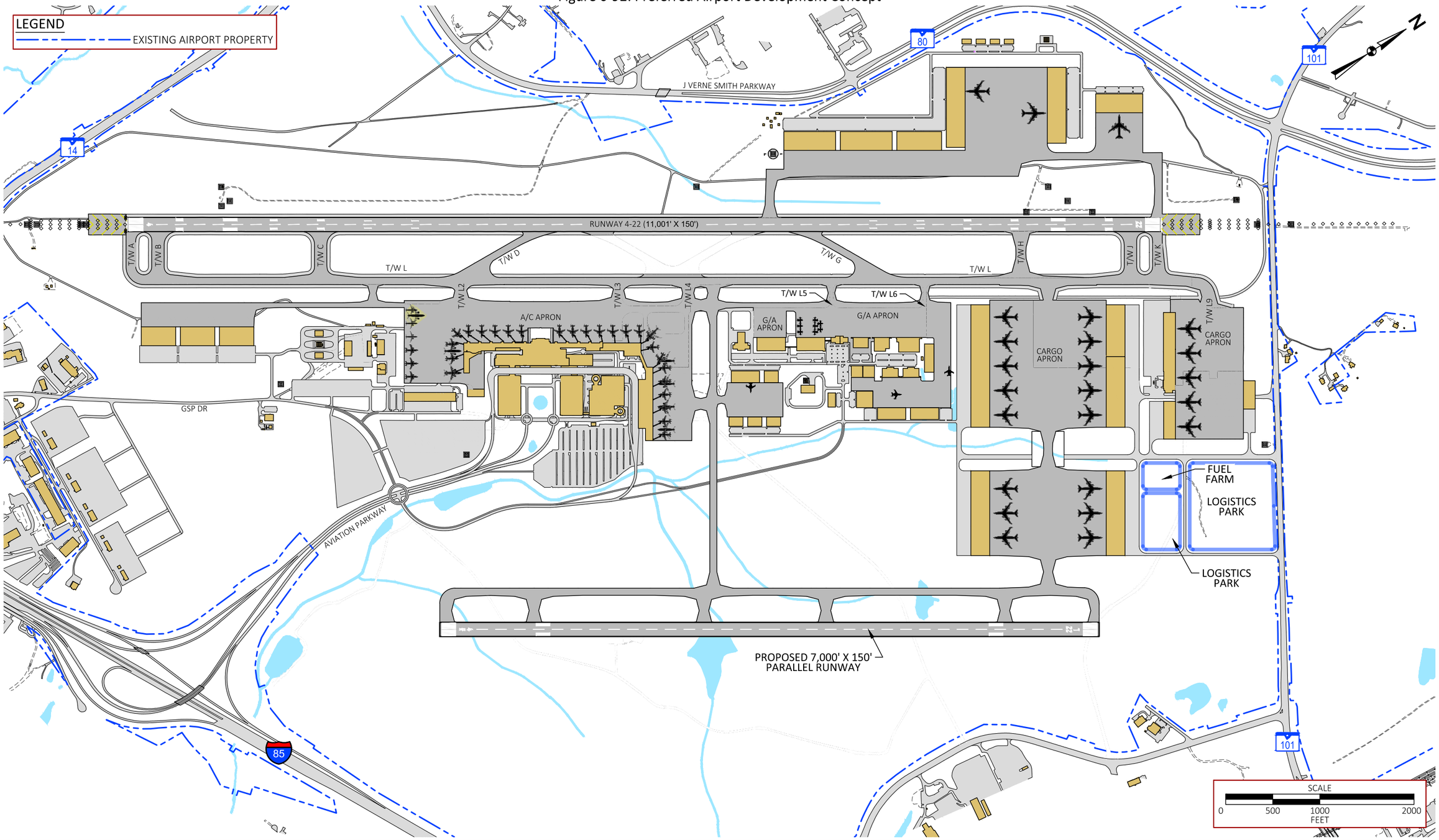
This page has been intentionally left blank.

6.3. SELECTED AIRPORT DEVELOPMENT PLAN

The individual preferred and refined development alternatives for each functional area of GSP property considered in the preceding sections collectively represent the Airport's long-term vision for the physical development of its property. Figure 6-92 presents this long-term development vision for GSP.

This page has been intentionally left blank.

Figure 6-92: Preferred Airport Development Concept



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\ALT-PREFERRED.dwg

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019

AIRPORT MASTER PLAN UPDATE

CHAPTER 7: IMPLEMENTATION PLAN

McFarland Johnson

Table of Contents

Chapter 7 - Implementation

7. Implementation Plan 7-1
7.1. Overview 7-1
7.2. Sources of Capital Funding 7-1
7.2.1. FAA Grant Funding 7-2
7.2.2. Cargo Service Funding 7-2
7.2.3. South Carolina Aeronautics Commission Funding 7-2
7.2.4. Local Funding Options 7-3
7.3. Airport Capital Improvement Plan (ACIP) 7-5
7.3.1. Order of Magnitude Cost Estimates 7-5
7.3.2. Project Phasing Periods 7-5

List of Tables

Chapter 7 – Implementation

Table 7-1 : Airport Capital Improvement Program – Phase One 7-6
Table 7-2 : Airport Capital Improvement Program – Phase Two 7-13
Table 7-3 : Airport Capital Improvement Program – Phase Three 7-19
Table 7-4 : Airport Capital Improvement Program – Phase Four 7-23

List of Figures

Chapter 7 – Implementation

Figure 7-1 : Airport Capital Improvement – Phase One 7-11
Figure 7-2 : Airport Capital Improvement – Phase Two 7-17
Figure 7-3 : Airport Capital Improvement – Phase Three 7-21
Figure 7-4 : Airport Capital Improvement – Phase Four 7-25
Figure 7-5 : Phasing Plan 7-27

7. Implementation Plan

This chapter of the Airport Master Plan incorporates the preferred Airport development alternatives identified in Chapter 6, *Alternatives*, into a phased 20-year Airport Capital Improvement Program (ACIP) for the Greenville-Spartanburg International Airport (GSP or the Airport). The ACIP details a single approach to funding and implementing the preferred development alternatives by providing a schedule for phased improvements, estimations of overall project cost, and the anticipated funding share between typical funding partners including federal, state, and local funding partners. This chronological plan provides guidance for continued maintenance, upgrade, and expansion of facilities consistent with the Airport facility requirements and long-term strategic vision of the Airport District.

The ACIP identified in this chapter does not represent an obligation of local funds, nor does it commit federal or state funding until demonstrating proper project justification and environmental clearance. In addition, other state and local coordination may also be necessary, depending upon the project. Cooperation with the FAA and South Carolina Aeronautics Commission is important to facilitate project formulation and coordinate implementation in a timely manner. It is also important that the development plan receive favorable environmental determination and community and stakeholder support.

7.1. OVERVIEW

The ACIP is a 20-year improvement schedule, including both eligible and non-eligible projects allowable under the federal (FAA) and state (South Carolina Aeronautics Commission) funding programs. This plan focuses on the capital projects necessary to implement the full project recommendations of the Airport Master Plan and includes rehabilitation of Runway 4-22 as recommended in the Airport's Pavement Management Plan (PMP) as discussed in Appendix A of this Master Plan.

Projects identified in the ACIP are a response to a facility or user needs, as a reasonable expectation of when demand warrants and funding becomes available. The identification and phasing of projects is largely determined through recommendations resulting from Master Plan findings, in which the assignments of project priorities, phasing, and estimated costs were consulted with the Airport District.

7.2. SOURCES OF CAPITAL FUNDING

To cover project costs as well as the local share, GSP has several ways in which to fund projects. They are summarized in the following sections.

- FAA Grant Funding
- Cargo Service Funding
- South Carolina Aeronautics Commission Funding
- Local Funding Options

7.2.1. FAA Grant Funding

For public-use facilities like GSP, the FAA Airport Improvement Program (AIP) provides up to 90 percent funding for public, non-revenue generating elements of the airport such as runways, taxiways, aprons, and lighting, as well as necessary planning and environmental studies. The remaining 10 percent is typically covered by the Airport District. FAA funding available for the GSP capital program is as follows:

- **Entitlement Funds:** The Airport receives entitlement funding from the FAA based on the number of passengers that are enplaned at the airport annually. GSP also receives a cargo entitlement from the FAA based on the percentage of total cargo weight landed annually. Entitlement funding is applied to projects eligible for federal funding.

- **Discretionary Funds:** Funding above the entitlement amount is then obtained from the FAA through discretionary funding. It should be noted that discretionary funding is competitive. Therefore, GSP competes for these funds nationally as well as with regional airports.

7.2.2. Cargo Service Funding

Cargo service airports are airports that, in addition to any other air transportation services that may be available, are served by aircraft providing air transportation of only cargo with a total annual landed weight of more than 100 million pounds.

Airports qualified as cargo service airports share three percent of AIP apportionment made available to them in accordance with Title 49 U.S. Code 47114(c)(2). Cargo funds are apportioned to each cargo service airport in the same proportion as its proportion of landed weight of cargo aircraft to the total landed weight of cargo aircraft at all qualifying airports. No cargo service airport is entitled to more than eight percent of the total amount apportioned to all-cargo service airports. Cargo service apportionments may only be used at the airport for which the apportionment is made.

GSP exceeds the annual threshold of 100 million pounds and qualifies as a cargo service airport. Therefore, the Airport receives this funding each year with AIP entitlement funding.

7.2.3. South Carolina Aeronautics Commission Funding

The South Carolina Aeronautics Commission (SCAC) funds airport improvements from three primary sources: state tax levied on commercial airlines that service the state's commercial airports, aviation fuel taxes, and the state's General Fund[1].

From these sources, the SCAC funds the state airport maintenance program, repairs and maintains state-owned Automated Weather Observing Systems (AWOS), provides state match of AIP grants at eligible airports, funds other discretionary projects, and provides administrative functions of the SCAC in servicing airport needs. The state airport maintenance program makes funding

[1] South Carolina Aviation System Plan, 2018.

available for pavement repairs, cleaning, marking, and marking removal/cleaning. The program funds 75 percent of costs with the remaining 25 percent required of airport sponsors.

From the 1980-2009 period, GSP received approximately $382,000 in funding from SCAC. Since 2010, GSP has not pursued and/or received funding from SCAC.

7.2.4. Local Funding Options

GSP has several options to fund their local share for federally-funded projects and other non-eligible discretionary projects, which are summarized in this section.

Airport Operating Reserves and Financing

As noted in the Airport District's financial statements[2], all foreseeable normal operational capital projects at GSP within a ten-year horizon are projected to be funded internally with Airport District reserve funds and/or with FAA grant funds. For new "special projects" outside the normal operational scope, management has the option to utilize a revolving Line of Credit (LOC), which was approved by the District Commission in May 2016. As special projects are completed, they can be "termed out" (removed from the LOC and replaced with a fixed permanent loan), at management's discretion.

Public Financing or Bonding

For large projects that are not eligible for federal funding but may have widespread local public impact and interest, airports frequently utilize capital market bonds to finance long-term construction projects. There are four basic types of municipal bonds available to GSP: general obligation (GO) bonds, general airport revenue bonds (GARB), Passenger Facility Charges (PFC) - backed bonds, and special facility bonds. Bond proceeds are the largest sources of funds for airport capital needs, accounting for approximately 54 percent of the total[3].

In August 2001, the Airport District issued $4.99 million of taxable revenue bonds (GARB), the proceeds from which were used to construct a new rental car facility and related improvements.

A summary of the other bond types is as follows:

- GO Bonds: Supported by the overall tax base of the issuing entity (the airport sponsor), GO bonds often carry the lowest interest rate.
- GA Revenue Bonds: Repaid by the revenues generated by the airport, or other revenues as defined in the bond indenture, GARBs are the most common form of airport debt.
- PFC-Backed Bonds: Either stand-alone or "double-barrel", PFC-backed bonds are backed solely by PFC revenues or by a combination of PFC revenues and other airport revenues generated by rentals, fees, and charges. General airport revenues can be pledged as a backup if enplanement activity decreases and PFC revenues do not meet the obligation.

---

[2] Greenville-Spartanburg Airport District, Financial Statements and Schedule of Expenditures of Federal Awards, as of and for the Years Ended June 30, 2017 and June 30, 2016.
[3] Airports Council International – North America

- **Special Facility Bonds:** Special facility bonds are used to construct a terminal or facility for a named airline and are backed by lease payments which are structured to cover debt service to the bonds.

A recent Airports Council International – North America (ACI-NA) survey indicated that large hub airports were anticipating financing 58 percent of planned projects through bonds, medium hubs at 23 percent, and small hubs at 22 percent.

Passenger Facility Charges (PFC)

With oversight from the FAA, GSP has the authority to impose PFCs up to $4.50 for each passenger enplaning at the Airport. PFCs are collected by the air carriers on behalf of the airport and are remitted monthly. The Airport District does not currently impose PFCs at the Airport.

PFCs can be utilized on projects that are considered AIP eligible, as well as for additional improvements to the passenger terminal. A summary of eligible uses of PFC revenues include:

- All or part of the allowable cost of an FAA approved project,
- Debt service and financing costs associated with bond issuance, and
- Combined with AIP and Aviation Capital Grants on eligible projects as the local match to reach 100 percent funding.

To be considered eligible for PFC funding, projects must meet certain criteria and address one or more of the following:

- Preserve or enhance safety, security, or capacity of the national air transportation system;
- Reduce noise or mitigate noise impacts resulting from an airport; and
- Present opportunities to enhance competition between or among air carriers.

While the PFC program is complementary to Federal airport grant programs, there are limitations and restrictions. Most notably, medium and large hub airports that impose a PFC face a reduction in the AIP apportionment funds they would normally receive.

Private Funding

Private funding is an option for certain projects at airports, generally including design and construction of hangars and/or office/hangar facilities for fixed base operators (FBOs), other aeronautical businesses, or corporate flight department, aircraft charter, and/or aircraft management operators. At GSP, the short-term ACIP considered here does not include projects likely to be privately funded. However, in some instances project funding can be mobilized more quickly by partnering with private interests to advocate for state tax incentives or job creation tax credits if the projects are of a substantial scale and scope. In this way, GSP can partner with private interests to broker development deals that will benefit the Airport over the long term by increasing operations, utilization of other on-airport maintenance providers, and fuel sales.

7.3. AIRPORT CAPITAL IMPROVEMENT PLAN (ACIP)

7.3.1. Order of Magnitude Cost Estimates

Order of magnitude estimates of construction cost for the preferred development alternatives identified in Chapter 6, *Alternatives*, and their enabling projects, were prepared to support the development of the ACIP and inform Airport decision making. Detailed quantity-based cost estimates are presented in Appendix D of this Master Plan and are expressed in 2018 dollars. Project cost reflected in the ACIP were developed from this information.

7.3.2. Project Phasing Periods

Projects are phased to facilitate systematic development over the course of the next 20 years. Projects appearing in the first phase are of greater importance to the Airport and have the least tolerance for delay. Additionally, some projects included in an early phase may be a prerequisite for other planned improvements in a later phase. The development phasing for GSP has been divided into four distinct phases as follows:

- Phase I: (0 to 5 years), 2019-2023
- Phase II: (6 to 10 years), 2024-2028
- Phase III: (11 to 20 years), 2029-2038
- Phase IV Beyond 2038 or as demand materializes.

The phasing of individual projects should undergo periodic review to determine the need for changes based upon variations in forecast demand, available funding, economic conditions, and/or other factors that may reasonably influence airport development. Additionally, other projects not foreseen in this report may be identified in the future and would, therefore, likely necessitate changes in the phasing of projects and the overall ACIP. Further, the projects and overall development identified in the ACIP, though tied to a time table, will only occur once the triggering demand and/or need is realized.

Phase One – Zero to Five Years

The phasing plan established for each of the identified projects was developed to ensure a logical and feasible implementation of the master plan. Special attention has been placed on the first five years of the ACIP. These projects slated for immediate implementation have been identified as critical to the Airport in terms of both providing adequate facilities to meet the needs of its users as well as supporting the strategic economic development initiatives of the Airport District.

Phase One improvements include projects generated from the recommendations of this Master Plan and the runway rehabilitation project currently outlined in the Airport's CIP.

Phase One improvements are identified, described and costed in Table 7-1 and graphically depicted in Figure 7-1.

Table 7-1: Airport Capital Improvement Program – Phase One

Project ID	Project	Description	Funding			Estimated Cost
A	Runway 4-22 Rehabilitation	Runway 4-22 Rehabilitation as identified and recommended in the PMP report (Appendix A)	90%	FAA Share:	$ 11,558,981	$12,843,313
			5%	State Share:	$ 642,166	
			5%	Local Share:	$ 642,166	
1	Relocated and Expanded Employee Lot Design	Construct approximately 17,700 square yards (SY) automobile parking lot south of Airport Fuel Farm.	0%	FAA Share:	$ -	$181,000
			0%	State Share:	$ -	
			100%	Local Share:	$ 181,000	
2	Economy Surface Lot Expansion Design / Construction	Design an expansion of new economy lot totaling approximately 72,500 SY and access road connection to Aviation Parkway.	0%	FAA Share:	$ -	$11,849,595
			0%	State Share:	$ -	
			100%	Local Share:	$ 11,849,595	
3	Aviation Parkway Improvement Phase 1 Design / Construction	Design mill and overlay rehabilitation of Aviation Parkway from I-85 to GSP Drive.	90%	FAA Share:	$ 925,200	$1,028,000
			5%	State Share:	$ 51,400	
			5%	Local Share:	$ 51,400	
4	ARFF Relocation Construction	Construct approximately 21,200 square feet (SF) ARFF building and associated pavements. Demolish existing ARFF building.	90%	FAA Share:	$ 7,010,852	$7,789,835
			5%	State Share:	$ 389,492	
			5%	Local Share:	$ 389,492	
5	Garage C Utility Upgrade Design/Construction	Enabling utility extension project.	0%	FAA Share:	$ -	$930,000
			0%	State Share:	$ -	
			100%	Local Share:	$ 930,000	
6	Master Environmental Assessment	Prepare an Environmental Assessment which considers the impacts of projects listed within Phase I and Phase II of this CIP.	90%	FAA Share:	$ 450,000	$500,000
			5%	State Share:	$ 25,000	
			5%	Local Share:	$ 25,000	
7	Air Cargo Apron Expansion - Phase 2 Construction	Construct Air Cargo Apron Expansion Phase 2 previously designed.	90%	FAA Share:	$ 11,711,610	$13,012,900
			5%	State Share:	$ 650,645	
			5%	Local Share:	$ 650,645	

Project ID	Project	Description	Funding			Estimated Cost
8	Relocated and Expanded Employee Lot Construction	Construct new employee parking lot near maintenance building south of CDF totally approximately 500 parking spaces.	0%	FAA Share:	$ -	$2,531,050
			0%	State Share:	$ -	
			100%	Local Share:	$ 2,531,050	
9	Garage C (incl. CONRAC) and GSP Dr. Realignment Construction	Construct the previously designed Garage C (incl. CONRAC) and realignment of GSP Drive around Garage C to provide garage access.	0%	FAA Share:	$ -	$48,000,000
			0%	State Share:	$ -	
			100%	Local Share:	$ 48,000,000	
10	Concourse A and B Jet bridges (A 0.5 and B 4.5) Design/Construction	Install new jet bridge at Gate A 0.5 and B 4.5 and improve Gate A1 holdroom as able to accommodate additional holdroom demand.	90%	FAA Share:	$ 3,816,540	$4,240,600
			5%	State Share:	$ 212,030	
			5%	Local Share:	$ 212,030	
11	Airport Fuel Farm Expansion - Phase 1 Design/Construction	Design and construct fuel farm expansion to provide an additional 150,000-gallon Jet-A fuel capacity.	90%	FAA Share:	$ 1,510,020	$1,677,800
			5%	State Share:	$ 83,890	
			5%	Local Share:	$ 83,890	
12	Closure of Taxiway E & F and Removal of Pavement	Mark and publish Taxiway E and Taxiway F as closed. Remove pavement and stockpile for future use. Return area to grass.	90%	FAA Share:	$ 229,973	$255,525
			5%	State Share:	$ 12,776	
			5%	Local Share:	$ 12,776	
13	FBO Expansion and GA FIS Relocation Design	Expand FBO building by 5,000 SF -10,000 SF to include general aviation FIS facilities.	0%	FAA Share:	$ -	$129,680
			0%	State Share:	$ -	
			100%	Local Share:	$ 129,680	
14	Apron Edge Taxilane Widening and GA Apron Rehabilitation Design	Widen apron edge taxilane from TWYs L3 to L6 to maintain centerline alignment of apron edge taxilane from TWY L3 to L2 and rehabilitate the GA apron.	90%	FAA Share:	$ 228,600	$254,000
			5%	State Share:	$ 12,700	
			5%	Local Share:	$ 12,700	
15	Concourse B Expansion - Gate B5 Design	Design expansion to Concourse B capable of immediately providing one additional gate and eventually a second gate position upon relocation of the ATCT.	90%	FAA Share:	$ 726,300	$807,000
			5%	State Share:	$ 40,350	
			5%	Local Share:	$ 40,350	

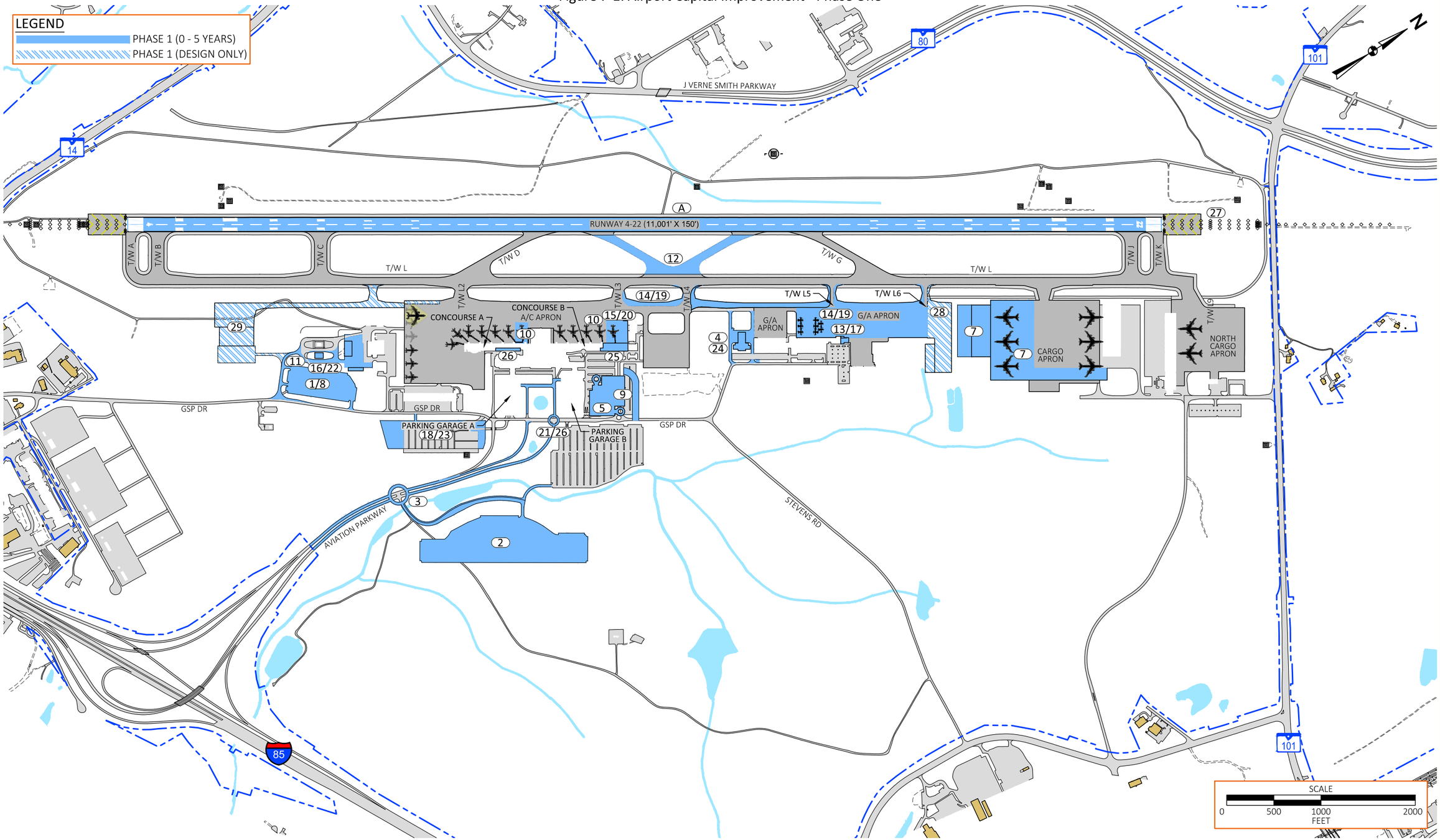
Project ID	Project	Description	Funding			Estimated Cost
16	Maintenance Yard Expansion - Phase 1 Design	Expand airport maintenance apron by approximately 3,500 SY supported by a vehicle storage and servicing building of approximately 12,500 SF.	90%	FAA Share:	$ 109,800	$122,000
			5%	State Share:	$ 6,100	
			5%	Local Share:	$ 6,100	
17	FBO Expansion and GA FIS Relocation Construction	Construct the previously designed FBO Expansion and relocation of GA FIS facilities.	0%	FAA Share:	$ -	$1,815,520
			0%	State Share:	$ -	
			100%	Local Share:	$ 1,815,520	
18	New Economy Parking Lot Phase 1 Design	Design new economy parking lot of approximately 35,000 SY by expanding overflow lot and relocating cell phone lot.	0%	FAA Share:	$ -	$228,000
			0%	State Share:	$ -	
			100%	Local Share:	$ 228,000	
19	Apron Edge Taxilane Widening and GA Apron Rehabilitation Construction	Construct the previously designed widening of apron edge taxilane (L3-L6) and rehabilitation of GA apron.	90%	FAA Share:	$ 3,906,752	$4,340,835
			5%	State Share:	$ 217,042	
			5%	Local Share:	$ 217,042	
20	Concourse B Expansion - Gate B5 Construction	Construction of Concourse B expansion and installation of Gate B5 jet bridge.	0%	FAA Share:	$ -	$11,302,600
			0%	State Share:	$ -	
			100%	Local Share:	$ 11,302,600	
21	Aviation Pkwy. & GSP Dr. North Intersection Roundabout Design	Design roundabout to replace full stop intersection of GSP Drive and Aviation Parkway near the south east corner of Garage B.	0%	FAA Share:	$ -	$48,000
			0%	State Share:	$ -	
			100%	Local Share:	$ 48,000	
22	Maintenance Yard Expansion - Phase 1 Construction	Construct the previously designed phase 1 maintenance yard expansion.	90%	FAA Share:	$ 1,533,591	$1,703,990
			5%	State Share:	$ 85,200	
			5%	Local Share:	$ 85,200	
23	New Economy Parking Lot Phase 1 Construction	Construct previously designed new economy parking lot.	0%	FAA Share:	$ -	$3,197,650
			0%	State Share:	$ -	
			100%	Local Share:	$ 3,197,650	

Project ID	Project	Description	Funding			Estimated Cost
24	Airfield Electrical Vault Relocation Design/Construction	Design and construct the relocation of the airfield electrical vault as part of the ARFF relocation.	90%	FAA Share:	$ 1,861,200	$2,068,000
			5%	State Share:	$ 103,400	
			5%	Local Share:	$ 103,400	
25	ARFF and Airfield Electrical Vault Demo	Demolish and return to turf the existing ARFF building and the airfield electrical vault contained within.	90%	FAA Share:	$ 489,600	$544,000
			5%	State Share:	$ 27,200	
			5%	Local Share:	$ 27,200	
26	Aviation Pkwy. & GSP Dr. North Intersection Roundabout Construction	Construct previously designed roundabout for northern intersection of Aviation Parkway and GSP Drive near the southeast corner of Garage B.	0%	FAA Share:	$ -	$768,645
			0%	State Share:	$ -	
			100%	Local Share:	$ 768,645	
27	Runway 22 ALSF-2 Design/Construction	Design and construct an upgrade of the existing Runway 22 ALS (MALSR) to an ALSF-II system.	90%	FAA Share:	$ 5,185,980	$5,762,200
			5%	State Share:	$ 288,110	
			5%	Local Share:	$ 288,110	
28	GA Apron Expansion - Phase 1a Design & Site Preparation	Design GA Apron expansion of 18,000 SY and site prep for GA hangars	90%	FAA Share:	$ 2,044,922	$2,272,135
			5%	State Share:	$ 113,607	
			5%	Local Share:	$ 113,607	
29	South MRO Development Area - Phase 1 Design & Site Preparation	Design and site preparation Phase 1 of the South MRO development area to include 2,000-foot access taxiway, 9,000 SY apron, 70,000 SF MRO hangar, and associated landside access and parking.	90%	FAA Share:	$ 2,878,470	$3,198,300
			5%	State Share:	$ 159,915	
			5%	Local Share:	$ 159,915	
TOTAL Phase 1				FAA Share:	$ 56,178,389	$132,656,528
				State Share:	$ 3,121,022	
				Local Share:	$ 73,357,117	

Source: McFarland Johnson, 2018; Avcon, 2018.

This page has been intentionally left blank.

Figure 7-1: Airport Capital Improvement - Phase One



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\PHASING.dwg

This page has been intentionally left blank.

Phase Two – Six to Ten Years

Phase Two of the ACIP focuses on terminal expansion (airside and concourse), landside access improvements, the continued growth of the air cargo area, and opportunities in the Southside Aviation area.

Phase Two improvements are identified, described and costed in **Table 7-2** and graphically depicted in **Figure 7-2**.

Table 7-2: Airport Capital Improvement Program – Phase Two

Project ID	Project	Description	Estimated Cost
30	Concourse A Expansion and FIS Development Design	Design Concourse A expansion and FIS corridor development	$617,000
31	GA Apron Expansion - Phase 1b Construction	Construct the previously designed GA apron expansion of approximately 18,000 SYSY north of the existing GA apron as well as one 300'x300' aircraft hangar.	$16,092,535
32	Taxiway H Design/Construction	Design and construct an 90-degree entrance/exit taxiway to Runway 4-22 from Taxiway L approximately 1,100 feet south of Taxiway J.	$3,573,435
33	South MRO Development Area - Phase 1 Construction	Construct Phase 1 of the South MRO development area previously designed and site prepared. Includes extended taxilane and concrete apron.	$6,125,445
34	Transient Apron Rehabilitation for Airline Remote Hardstand Design / Construction	Design and construct rehabilitation of the Airport's existing transient apron of approximately 19,500 SY.	$14,776,500
35	Air Cargo Apron and Building Expansion - Phase 3 Design / Construction	Construct an air cargo apron expansion of approximately 42,000 SYSY east of Phase 1 air cargo apron along with air cargo support building, landside access and parking.	$15,298,800

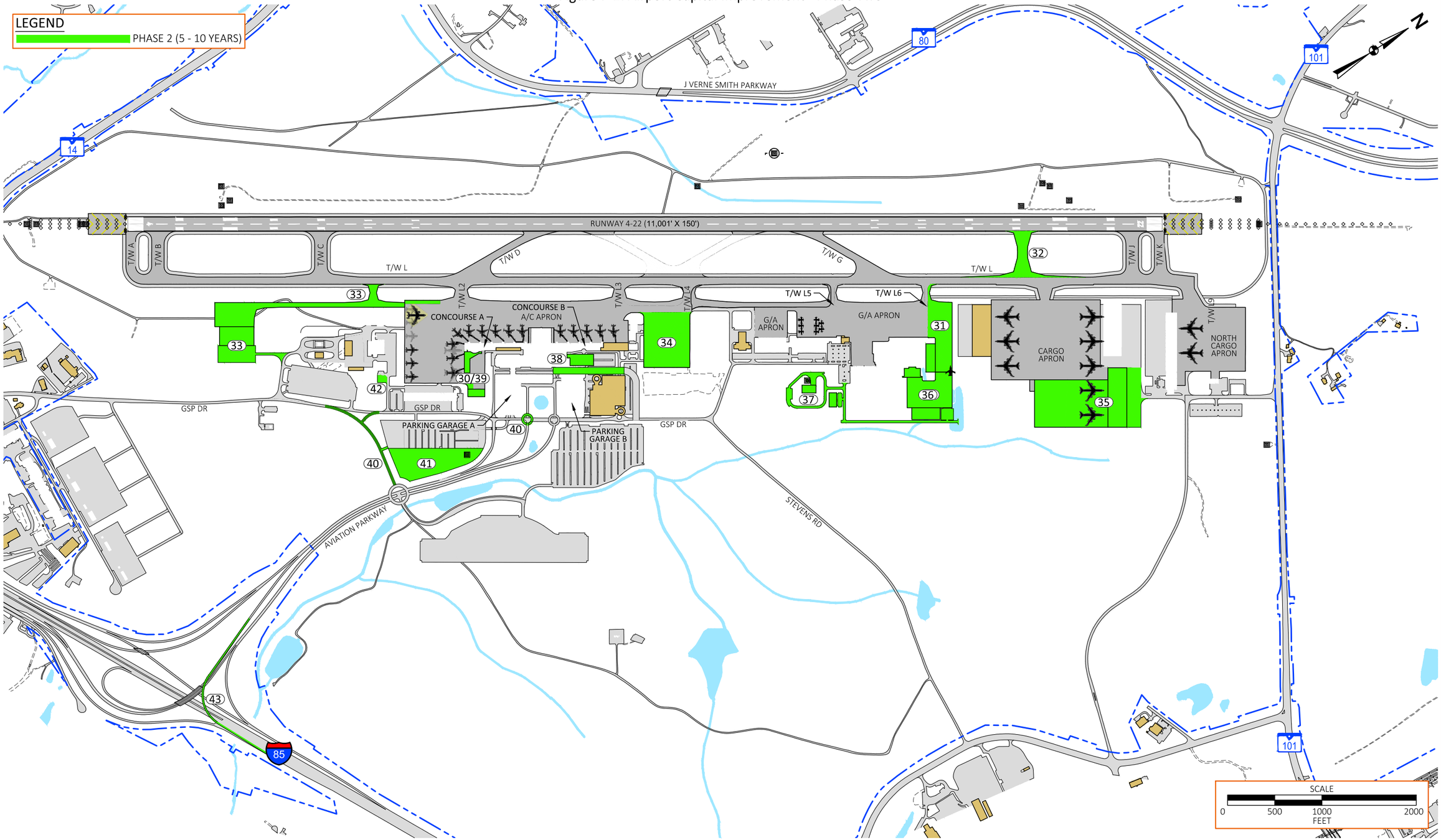
Project ID	Project	Description	Estimated Cost
36	GA Apron Expansion - Phase 2 Design / Construction	Design and construct a GA apron expansion of approximately 17,000 SY east of the Phase 1 GA apron expansion.	$4,649,600
37	ATCT Relocation Design / Construction	FAA Project to relocate ATCT to a new tower site including demolition of existing tower.	$20,843,150
38	Terminal Baggage Claim and Terminal Curb Expansion Design / Construction	Design and construct expansion of terminal core of approximately 30,000 SF to the north to provide for a second baggage claim area, and design/construct widening of terminal loop road.	$9,477,005
39	Concourse A Reconfiguration and FIS Corridor Construction	Design and construct expansion of Concourse A of approximately 20,000 SF to accommodate two new flex gates capable of supporting widebody aircraft and opportunity to provide a sterile corridor to FIS to support international air carrier operations.	$8,641,290
40	GSP Dr. Realignment and Aviation Pkwy. Intersection Roundabout Design / Construction	Realign GSP Drive from a point south of the Airport's fuel farm to intersect Aviation Parkway near an existing service road juncture and integrate via dual land roundabout. Provide new ingress to the new surface lot.	$2,260,554
41	New Surface Economy Lot - Phase 2 Design / Construction	Design and construct an expansion to the Phase 1 of the new surface economy lot of approximately 25,500 SY.	$4,265,800
42	Maintenance Yard Expansion - Phase 2 Design / Construction	Expand the maintenance apron by approximately 3,250 SY to expand exterior storage and support a new 6,000 SF maintenance building.	$1,403,600

Project ID	Project	Description	Estimated Cost
43	Aviation Pkwy to Northbound I-85 Flyover Design / Construction	State to design/construct Aviation Parkway flyover of I-85 to enable seamless integration with northbound lanes.	$8,373,450
		Total Phase 2:	$116,398,164

Source: McFarland Johnson, 2018; Avcon, 2018

This page has been intentionally left blank.

Figure 7-2: Airport Capital Improvement - Phase Two



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\PHASING.dwg

This page has been intentionally left blank.

Phase Three – Eleven to Twenty Years

Phase Three of the ACIP focuses on cargo facility development, Concourse B construction, airfield support facilities, and continued development in the Southside Aviation area.

Phase Three improvements are identified, described and costed in **Table 7-3** and graphically depicted in **Figure 7-3**.

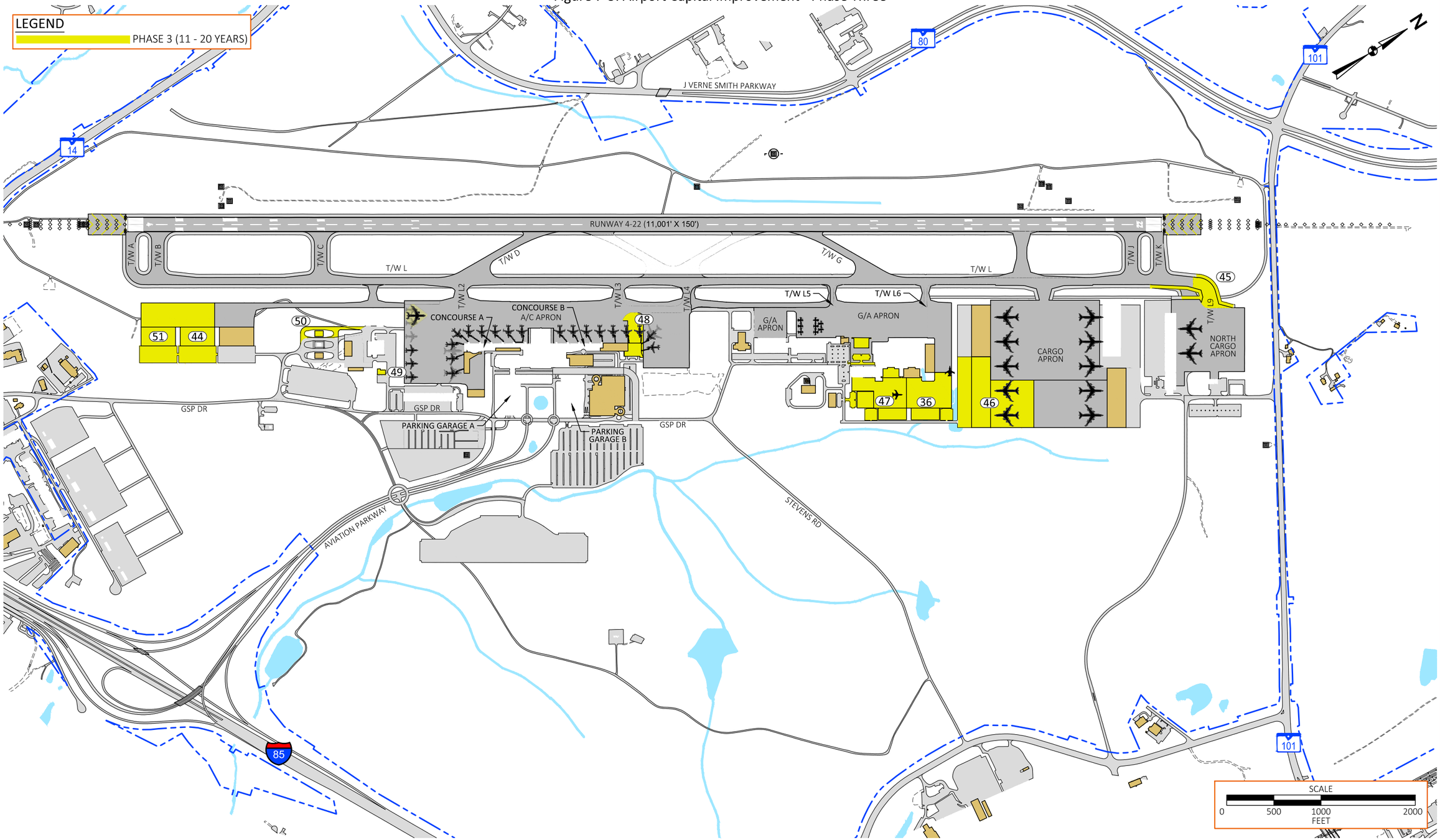
Table 7-3: Airport Capital Improvement Program – Phase Three

Project ID	Project	Description	Estimated Cost
44	South MRO Development Area - Phase 2 Environmental / Design / Construction	Environmentally determine, design, and construct extension to common access taxilane, 9,000 SY MRO apron, 70,000 SF MRO hangar, and associated landside access and parking facilities.	$3,962,800
45	Taxiway L9 Realignment Environmental / Design / Construction	Environmentally determine, design, and construct the realignment of Taxiway L9 to provide access to the North Cargo Apron perpendicularly and allow for an additional parking position.	$8,538,730
46	Cargo Apron and Building Expansion - Phase 4 Environmental / Design / Construction	Environmentally determine, design, and construct an approximately 24,500 SY expansion to the Cargo Apron, and associated air cargo building, landside access, and parking facilities.	$8,800,600
47	GA Apron Expansion - Phase 3 Environmental / Design / Construction	Environmentally determine, design, and construct a GA apron expansion of approximately 14,500 SY south of the phase 2 GA apron expansion.	$38,775,640
48	Concourse B Buildout and Apron Expansion Environmental / Design / Construction	Environmentally determine, design, and construct an expansion of the transient apron to connect with the air carrier apron, 15,000 SF expansion to Concourse B to provide for up to four additional gates, one of which being flexible to accept widebody aircraft.	$18,370,000
49	Maintenance Office Expansion incl. Parking Environmental / Design / Construction	Environmentally determine, design, and construct an expansion of the airport maintenance office or approximately 5,000 SF and associated parking facilities nearing 7,500 SF.	$1,202,050

Project ID	Project	Description	Estimated Cost
50	Airport Fuel Farm Expansion - Phase 2 Environmental / Design / Construction	Environmentally determine, design, and construct fuel farm expansion to provide an additional 150,000-gallon Jet-A fuel capacity.	$1,059,080
51	South MRO Development Area - Phase 3 Environmental / Design / Construction	Environmentally determine, design, and construct extension to common access taxilane, 9,000 SY MRO apron, 70,000 SF MRO hangar, and associated landside access and parking facilities.	$3,591,300
		Total Phase 3:	$84,300,200

Source: McFarland Johnson, 2018; Avcon, 2018

Figure 7-3: Airport Capital Improvement - Phase Three



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\PHASING.dwg

This page has been intentionally left blank.

Phase Four – Beyond Twenty Years

Phase Four of the ACIP loosely explores projects which can be reasonably anticipated beyond the typical 20-year planning horizon.

Phase Four improvements are identified, described, and costed in **Table 7-4** and graphically depicted in **Figure 7-4**. The full phasing plan is shown in **Figure 7-5**.

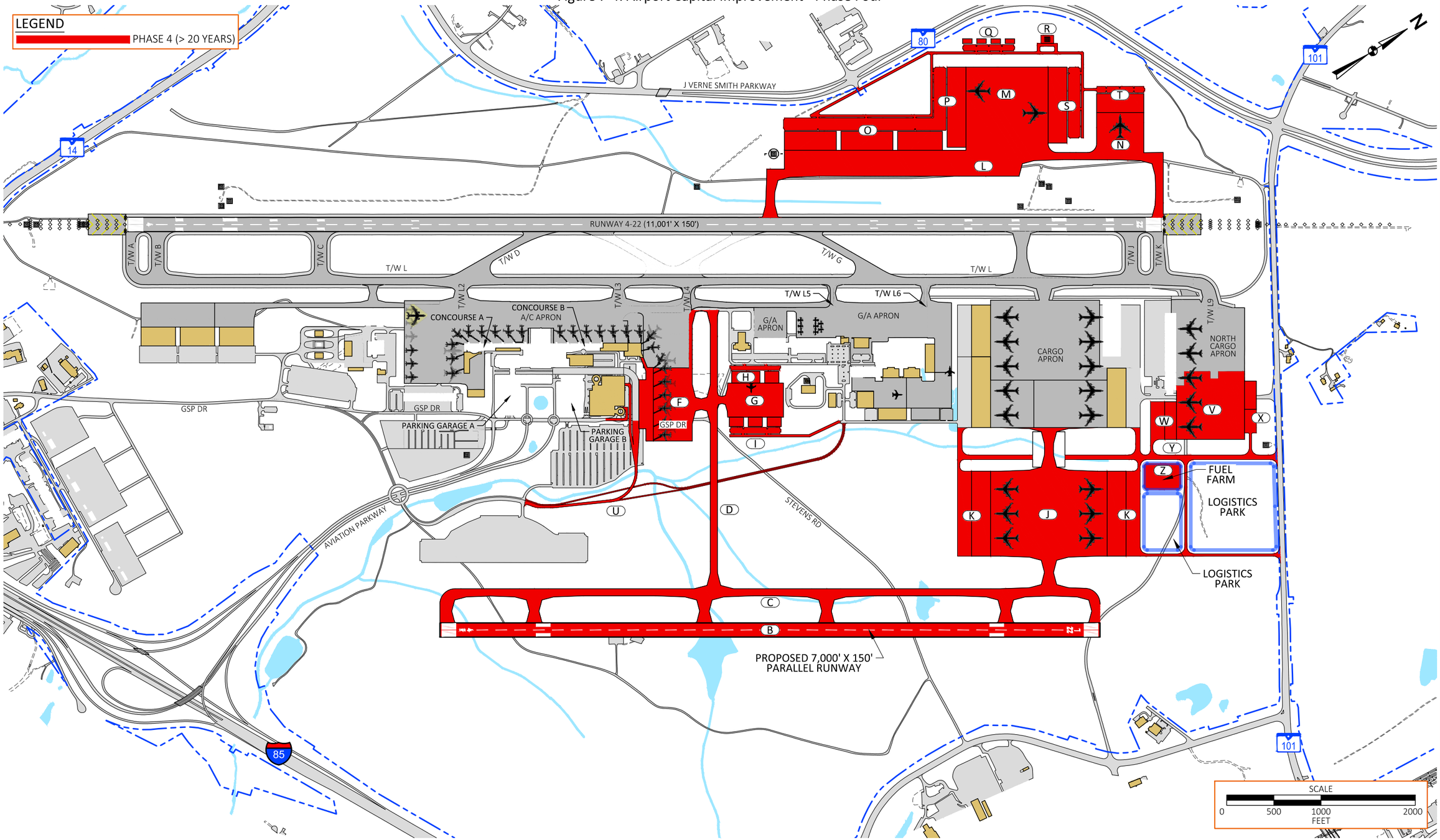
Table 7-4: Airport Capital Improvement Program – Phase Four

Project ID	Description	Estimated Cost
B	Proposed Runway 4R-22L	$32,483,130
C	Proposed Parallel Taxiway and Connectors	$38,154,065
D	Proposed Taxiway L4	$17,162,921
E	New Airport Long Economy Parking Lot	$6,653,500
F	Apron and Terminal Expansion	$49,738,250
G	Apron Expansion	$13,278,500
H	Hangars and Parking Lot	$13,484,485
I	Hangars and Parking Lot	$15,658,560
J	Cargo Apron Expansion and Connectors - Phase 4	$78,627,000
K	Cargo Apron - Hangars, Parking Lots and Roads - Phase 4	$79,828,550
L	Proposed Taxiway Northwest of Runway	$43,863,644
M	Large Aircraft Apron Northwest of Runway	$35,771,100
N	Aircraft Apron Northwest of Runway	$10,488,800
O	Northwest Apron - Phase 4: 3 Hangars, Parking, and Roads	$77,417,000
P	Northwest Apron - Phase 4: Hangars, Parking, and Roads	$50,999,650
Q	Northwest Apron - Phase 4: Aviation Support Buildings	$15,330,790
R	Northwest Apron - Phase 4: Fuel Farm Expansion	$2,237,700
S	Northwest Apron - Phase 4: Hangars, Parking, and Roads	$39,879,700
T	Northwest Apron - Phase 4: Hangars, Parking, and Roads	$24,349,500
U	Entrance Road to Terminal, Road to/from GA	$7,662,140
V	Cargo Apron Expansion Northeast	$20,295,600
W	Cargo Apron Expansion Northeast - Hangar and Parking	$12,677,850
X	Cargo Apron Expansion Northeast - Hangar and Parking	$9,222,420
Y	Road to Fuel Farm, Cargo Apron, and Logistics Park	$2,864,440
Z	Fuel Farm Expansion - Near Logistics Park	$3,268,000
	Total Phase 4:	$701,397,295

Source: McFarland Johnson, 2018; Avcon, 2018

This page has been intentionally left blank.

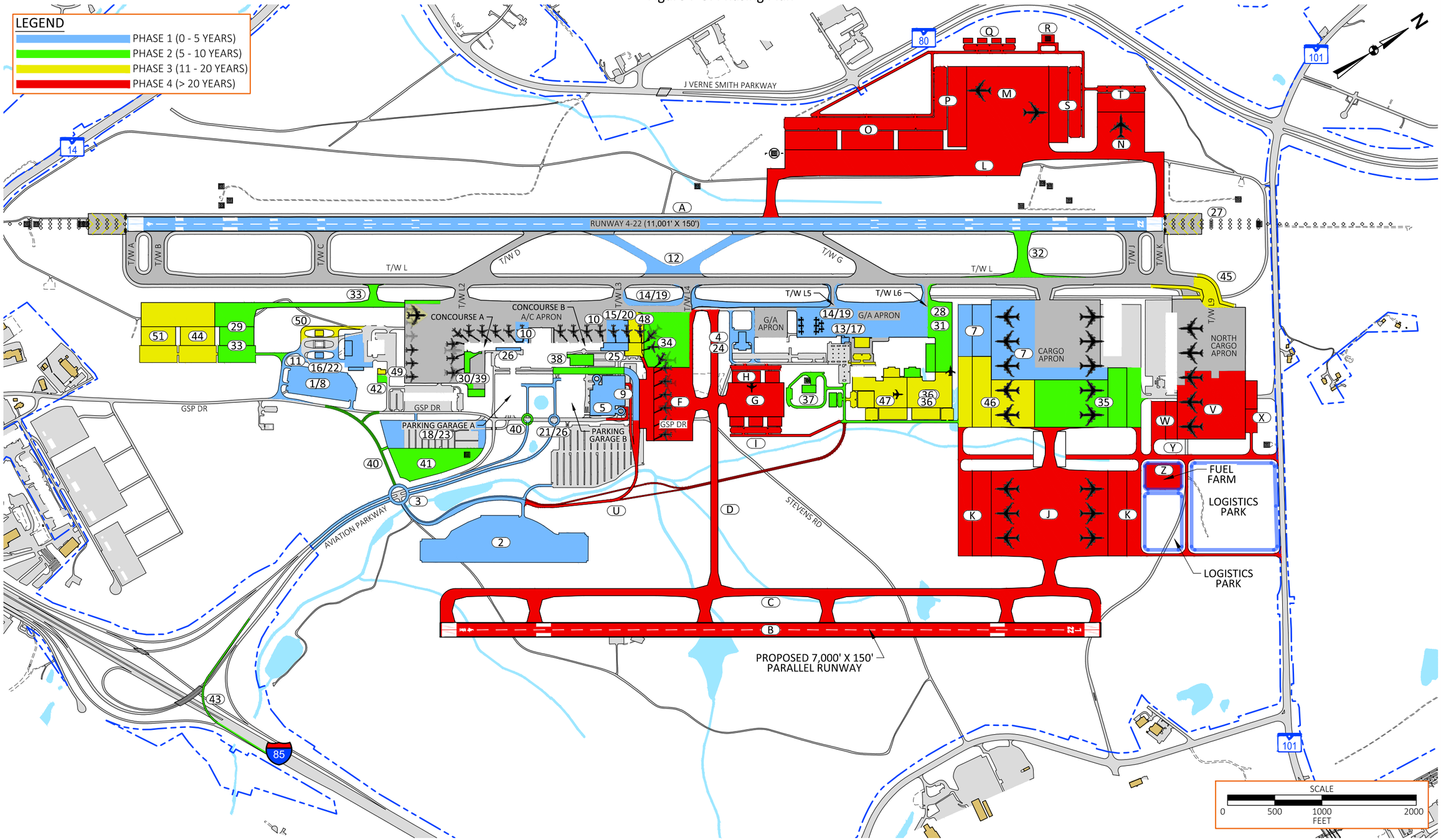
Figure 7-4: Airport Capital Improvement - Phase Four



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\PHASING.dwg

This page has been intentionally left blank.

Figure 7-5: Phasing Plan



K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Figure\PHASING.dwg

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE
CHAPTER 8: FINANCIAL

McFarland Johnson

Table of Contents

Chapter 8 – Financial

8. Financial 8-1
8.1. Short-Term ACIP Project Costs 8-1
8.2. Airport Financial Analysis 8-2
8.2.1. Airport Revenues from Lease Agreements and Tenant Fees 8-2
8.2.2. Historical Operating Revenues and Expenses 8-3
8.2.3. Forecast of Baseline Airport Operating Financial Performance 8-5
8.2.4. Forecast of Preferred Development Operating Financial Performance 8-7
8.3. Summary of the Short-Term Capital Program Funding Feasibility 8-9
8.4. Airport Governance and Policy Considerations 8-10
8.4.1. Airport Governance and Financial Structure 8-10
8.4.2. Commercial and General Aviation Business Policies 8-11
8.4.3. Use and Lease Agreements 8-12

List of Tables

Chapter 8 – Financial

Table 8-1 : Short Term Capital Project Costs 8-1
Table 8-2 : Snapshot of Facility Rents & Tenant Fees 8-2
Table 8-3 : Snapshot of FBO Operations Revenue Streams 8-3
Table 8-4 : Historical Operating Revenues and Expenses 8-4
Table 8-5 : Baseline Forecast of Airport Operating Financial Performance 8-6
Table 8-6 : Baseline Net Operating Income/(Deficit) Summary 8-6
Table 8-7 : Forecasted Activities Implementation Timeline 8-7
Table 8-8 : Forecast of Preferred Development Operating Financial Performance 8-8
Table 8-9 : Forecast of Airport Operating Financial Performance – Preferred Alternative 8-9
Net Operating Income/(Deficit) Summary 8-9
Table 8-10 : Estimated ACIP Short Term Local Funding Need & 8-9
Capital Funding Feasibility 8-9

8. Financial

As detailed in Chapter 7, *Implementation Plan*, the Greenville Spartanburg International Airport (GSP or Airport) Master Plan Update (MPU) sets forth a long-range Airport Capital Improvement Plan (ACIP) that can accommodate forecast demand levels at the Airport. This chapter explores the financial implications of implementing the preferred alternative of the MPU in the short-term in the following sections:

- Short-Term ACIP Project Costs
- Airport Financial Analysis
- Summary of Short-Term Capital Program Funding Feasibility
- Airport Governance and Policy Considerations

The focus of the analysis described in the sections that follow is the ability of the Airport to fund the preferred alternative and ACIP projects identified for the short-term.

8.1. SHORT-TERM ACIP PROJECT COSTS

The ACIP for projects at GSP during the short-term period (Fiscal Year (FY) 2019-2023) is summarized in Table 8-1 showing estimated Federal Aviation Administration (FAA), state, and local shares. These projects represent the highest priority for the Airport over the next five years.

Table 8-1: Short Term Capital Project Costs

Year	Total Cost	FAA	State	Local
2019	$8,900,835	$7,010,852	$389,492	$1,500,492
2020	$46,347,555	$17,718,143	$984,341	$27,645,071
2021	$41,173,783	$12,623,681	$701,316	$27,848,786
2022	$23,689,075	$8,226,743	$457,041	$15,005,291
2023	$12,545,280	$10,598,972	$588,832	$1,357,477
Total Short-Term	**$143,402,173**	**$56,178,389**	**$3,121,022**	**$84,102,762**

Source: McFarland Johnson, 2018

As shown in Table 8-1, the estimated local match for approved projects in the ACIP surpasses $73.3 million through 2023. The local share is significant due to the focus on projects that are non-eligible during the short-term. Notably, about $57 million of the local need (78 percent) is comprised of projects associated with passenger parking, employee parking, and airport access roadways.

The breakdown of eligible project funding represents an FAA share of 90 percent through the FAA Airport Improvement Program (AIP), and state and local shares each of five percent. To obtain FAA funding for these projects, the Sponsor must submit and/or update its five-year ACIP to the FAA on an annual basis. The annual ACIP update process is the FAA's mechanism for prioritizing its funding program on a state-wide basis and considers system-wide issues such as safety and capacity.

8.2. AIRPORT FINANCIAL ANALYSIS

This section describes and summarizes the analysis performed to determine the feasibility of funding the short term ACIP at GSP. The analysis begins with an assessment of the Airport's general financial strength and revenue streams, transitions to highlight historical performance and trends, and concludes with forecasts of future financial performance under two scenarios: a baseline condition and the preferred development alternative. The analysis is presented in the following sections:

- Airport Revenues from Lease Agreements and Tenant Fees
- Historical Operating Revenues and Expenses
- Forecast of Baseline Airport Operating Financial Performance
- Forecast of Preferred Development Operating Financial Performance

8.2.1. Airport Revenues from Lease Agreements and Tenant Fees

Aeronautical operators at GSP are obligated to pay to the Airport a variety of charges and fees associated with their activities. Charges and fees are based on rates established by the Airport District but also are subject of negotiation with operators. Rates and charges of fees at airports can vary, but often consist of the following:

- Rent for Terminal, Hangars, Parking, and Building Facilities
- Rent for Undeveloped Land
- Aircraft Landing Fees, Parking/Ramp, and Tie-Down Fees
- Commissions on Fuel Flowage, Operating Revenues, Aircraft Managed/Brokered/Sales

Land and facilities at GSP represent some of the Airport's most valuable assets for revenue generation. This is evidenced by the portion of operating revenues generated by airside facility use fees, rent payments made to the Airport by tenants of existing facilities, and revenues generated by concessionaires in the terminal. For this analysis, revenues from passenger parking, various ground transportation services (as detailed below), and expense reimbursements are not included so that the strength of GSP revenue generation direct from aeronautical operators can be assessed. A snapshot of operating revenues anticipated from facility rents and tenant fees budgeted for FY 2019 is presented in Table 8-2.

Table 8-2: Snapshot of Facility Rents & Tenant Fees

Facility Rents and Tenant Fees	FY 2019 Budgeted Revenues
Landing and Other Airside Fees	$3,202,640
Space and Ground Rental Fees	$10,927,865
Concessions and Other Revenue[1/]	$4,895,360
Total[1/]	$19,025,866
FY 2019 Budget Operating Revenues	$40,761,296
Percentage of FY 2019 Operating Budget	47%

Source: Airport Management, 2018.

[1/]Revenues from passenger auto parking, ground transport/limo/Uber/Lyft and expense reimbursements are not included. Revenues from FBO are shown in Table 8-3.

As indicated, revenues generated by facilities at GSP and tenant business activity that drive fees represent 47 percent of the Airport's operating revenues. These revenue streams are critical to the long-term financial performance of the Airport, especially as it relates to the sponsor's ability to self-fund or finance the short- and long-term ACIP.

In addition to the revenue streams described above direct from airline and non-airline aeronautical operators at GSP, the Airport District has diversified business operations to include functioning as a fixed-base operator (FBO) supporting both general and commercial aviation, to include air cargo services, on the Airport. These growth initiatives strengthen the position of the Airport District to capture revenues normally realized by private interests at most commercial service airports. A snapshot of FBO and cargo activities' contributions to GSP operating revenues is summarized in Table 8-3.

Table 8-3: Snapshot of FBO Operations Revenue Streams

FBO Revenue Stream	FY 2019 Budgeted Revenues
Aircraft Deicing	$56,000
Aircraft Ground Handling - Passenger	$75,000
Ground Aircraft Handling	$1,069,233
Warehousing Fees	$1,179,695
Lease Income	$411,526
Ground Support Income	$104,032
Gross Profit from Fuel Sales	$4,137,551
Total	$7,033,037
FY 2019 Budget Operating Revenues	$40,761,296
Percentage of FY 2019 Operating Budget	17%

Source: Airport Management, 2018.

As shown in Table 8-3, several FBO activities at the Airport are anticipated to account for approximately 17 percent of budgeted operating revenues at GSP for FY 2019.

Together, the traditional sources of revenue summarized in Table 8-2 and additional revenue streams shown in Table 8-3 consist of more than 70 percent of GSP operating revenues. The remaining 30 percent of operating revenues are generated by passenger parking, which is budgeted at roughly $12.7 million for FY 2019.

8.2.2. Historical Operating Revenues and Expenses

Historical revenue and expense statements for GSP was provided by Airport Management for the 2013-2017 period. This information gives some indication of trends that can be useful for forecasting future financial performance. Table 8-4 shows the historical revenues and expenses as documented in the audited financial statements for each respective year.

Table 8-4: Historical Operating Revenues and Expenses

Category	2013	2014	2015	2016	2017	AAGR
Operating Revenues						
Landing & Other Airside Fees	$2,241,484	$2,994,349	$2,918,915	$2,956,934	$3,222,021	9.5%
Space & Ground Rental Fees	$6,526,942	$8,011,832	$8,053,184	$8,709,634	$8,811,883	7.8%
Concessions Revenue	$12,383,451	$12,597,222	$13,342,259	$14,178,162	$16,314,117	7.1%
Expense Reimbursements	$668,066	$1,024,100	$1,112,448	$1,272,775	$1,268,283	17.4%
Other Revenue	$1,117,666	$1,057,549	$1,257,319	$1,247,052	$1,922,952	14.5%
Gross Profit on Fuel	-	-	-	-	$1,906,452	-
Total	**$22,937,609**	**$25,685,052**	**$26,684,125**	**$28,364,557**	**$33,445,708**	**9.9%**
Operating Expenses						
Airfield	$26,563	$273,926	$223,299	$293,485	$260,000	76.9%
Terminal Building	$1,782,034	$1,725,825	$2,218,801	$2,305,357	$2,370,823	7.4%
Administrative	$3,816,812	$4,120,058	$4,787,066	$5,034,654	$6,646,015	14.9%
Maintenance & Operations	$2,973,643	$3,104,747	$3,177,589	$3,080,767	$3,328,118	2.9%
Fire & Crash Department	$1,007,352	$1,040,878	$1,106,173	$1,044,790	$1,155,122	3.5%
Security	$1,021,931	$1,160,393	$1,242,102	$1,125,601	$1,216,434	4.5%
Other Direct Expenses	$1,660,421	$1,653,514	$1,870,713	$1,957,495	$4,061,604	25.1%
Loss on Disposal of Assets	$59,975	$2,027,434	$490,095	$195,388	$3,581	-50.6%
Depreciation	$9,657,926	$10,050,973	$9,725,558	$10,129,258	$10,846,378	2.9%
Pension	$533,700	$585,900	$689,240	$833,525	$1,177,925	21.9%
Total	**$22,540,357**	**$25,743,648**	**$25,530,636**	**$26,000,320**	**$31,066,000**	**8.4%**
Net Income/ (Deficit)	**$397,252**	**($58,596)**	**$1,153,489**	**$2,364,237**	**$2,379,708**	**56.4%**

Source: Airport Management, 2017.

As shown in **Table 8-4**, operating revenues at GSP have increased more than $10.5 million between 2013 and 2017, which represents an average annual increase of nearly 10 percent for the period. The highest-performing revenue categories were concessions, space and ground rental, and gross profit on fuel sales, which account for 77 percent of the revenue increases. Notably, profit on fuel sales represents only partial year income from Cerulean operating the Airport FBO.

During the same period, operating expenses increased at an average annual rate of more than eight percent. The primary drivers of Airport expense increases during the period were those associated with administrative, other direct expenses, and depreciation.

8.2.3. Forecast of Baseline Airport Operating Financial Performance

The baseline forecast for future revenues and expenses at GSP represents a scenario that assumes all current operating conditions remain the same. While this may be somewhat unrealistic, such a forecast represents a benchmark or snapshot in time that can be used as a measure for the performance of recommended alternatives. Therefore, the baseline forecast does not consider improvements to the Airport's financial performance that may occur through the implementation of the preferred development plan or other economic shifts that could alter recent trends. The baseline forecast is for operating revenues and expenses during the 5-year, FYs 2019-2023 period. Assumptions used in developing the baseline forecast included the following:

- Source of Base Year Financial Data: The baseline forecast utilizes GSP audited financial statements for the FY 2013-2018 period and operating revenue and expense budgets for FY 2019. Audited financial statements are used to identify trends regarding growth or decline in revenues and cost centers. The baseline forecast utilizes these trends to project financial performance from the FY 2019 budget, which is considered the base year for the forecast represents the Airport's best estimate for that year.

- Baseline Forecast Rates of Growth: As a rule, baseline financial forecasts are crafted with a conservative outlook on revenue generation. This is because revenues from aircraft operations (e.g., landing fees) and passenger activity (e.g., paid parking or terminal concessionaire sales) are variable - driven by external forces such as airlines and overall economic health and the passenger market. Despite this variability on the revenue side of the ledger, GSP must sustain operations and a facility in good condition, with a level of staffing, equipment, and readiness that can respond to changes in the passenger market.

  Guided by this forecast principle, the FY 2019 budgets for operating revenues and expenses at GSP were reviewed with Airport District leadership to identify anticipated changes in activity within revenue and expense centers. For example, revenues from landing and other airside fees and space and ground rental fees were expected to track in line with historical growth trends identified in Table 8-4. However, revenues from non-tenant fees such as Uber/Lyft operators are expected to increase by more than five times, ground aircraft handling by three times, and gross profit on fuel sales by 50 percent. To balance such a wide range of anticipated growth, the Baseline Forecast of revenues normalized average annual growth rates to be within 6.5 – 8 percent through the five-year period to remain conservative.

  Operating expenses were also anticipated to experience a wide range of activity in the FY 2019 budget, with professional services expenses decreasing by over 17 percent, and costs related to rentals and leases to more than double. As with operating revenues, the Baseline Forecast normalized annual growth rates to be just over five percent for the period.

  Overall, the normalization of growth rates in the Baseline Forecast maintained the same relationship of operating revenues to expenses shown in Table 8-4 for the historical period, which shows annual operating revenues tracking at about 1.5 - 2 percent ahead of operating expenses.

The baseline projection of revenues and expenses through FY 2024 and is detailed in Table 8-5.

Table 8-5: Baseline Forecast of Airport Operating Financial Performance

Category	2019	2020	2021	2022	2023
Operating Revenues					
Landing & Other Airside Fees	$3,202,640	$3,475,000	$3,770,522	$4,091,176	$4,439,099
Space & Ground Rental Fees	$10,927,865	$11,075,000	$11,224,116	$11,375,239	$11,528,397
Concessions Revenue	$17,401,439	$18,825,000	$20,418,617	$22,208,084	$24,223,493
Expense Reimbursements	$1,656,479	$1,750,000	$1,848,801	$1,953,181	$2,063,453
Other Revenue	$3,435,324	$4,010,111	$4,234,071	$4,475,082	$4,735,033
Gross Profit on Fuel	$4,137,550	$4,885,000	$5,373,500	$5,910,850	$6,501,935
Total	**$40,761,297**	**$44,020,111**	**$46,869,627**	**$50,013,611**	**$53,491,410**
Operating Expenses					
Salary & Benefits	$14,080,805	$14,714,441	$15,376,591	$16,068,537	$16,791,621
Professional Services	$526,105	$552,410	$580,031	$609,032	$639,484
Promotional Activities	$1,526,645	$1,595,344	$1,667,135	$1,742,156	$1,820,553
Administrative	$1,499,228	$1,604,174	$1,716,466	$1,836,619	$1,965,182
Insurance	$679,051	$732,696	$790,579	$853,034	$920,424
Contractual Services	$4,300,536	$4,494,060	$4,696,292	$4,907,626	$5,128,469
Rentals & Leases	$519,490	$555,854	$594,764	$636,398	$680,945
Repairs & Maintenance	$824,878	$890,043	$960,357	$1,036,225	$1,118,087
Supplies & Equipment	$1,533,212	$1,640,537	$1,755,374	$1,878,250	$2,009,728
Utilities	$1,908,549	$2,042,148	$2,185,098	$2,338,055	$2,501,719
Total	**$27,398,498**	**$28,821,706**	**$30,322,686**	**$31,905,932**	**$33,576,212**
Net Income/(Deficit)	**$13,362,799**	**$15,198,405**	**$16,546,940**	**$18,107,680**	**$19,915,199**

Source: McFarland Johnson, 2018.

As shown, total baseline operating revenues might be anticipated to grow from approximately $40.8 million in 2019 to nearly $53.5 million by 2023. During the same period, baseline operating expenses are forecast to increase from about $27.4 million to over $33.5 million in 2023. A summary of the baseline operating forecast is presented in Table 8-6.

Table 8-6: Baseline Net Operating Income/(Deficit) Summary

Year	Baseline Operating Revenues	Baseline Operating Expenses	Net Operating Income
2019	$40,761,297	$27,398,498	$13,362,799
2020	$44,020,111	$28,821,706	$15,198,405
2021	$46,869,627	$30,322,686	$16,546,940
2022	$50,013,611	$31,905,932	$18,107,680
2023	$53,491,410	$33,576,212	$19,915,199

Source: McFarland Johnson, 2018.

This forecast represents cumulative net operating income of more than $83.1 million for the period before depreciation, pension expense, and any losses on the disposal of assets.

8.2.4. Forecast of Preferred Development Operating Financial Performance

The Airport District has programmed several much-needed parking facility projects into the short-term ACIP detailed in *Chapter 7, Implementation Plan*. This section forecasts the impact of these projects to the Airport's financial performance and are programmed to take affect within the 5-year period as shown in **Table 8-7.**

Table 8-7: Forecasted Activities Implementation Timeline

Project	2019	2020	2021	2022	2023
Expansion of Air Cargo Apron	-	-	✓	✓	✓
Construction of Garage C Parking Facility	-	-	✓	✓	✓
Expansion of Existing Economy Parking Lot	-	-	-	-	✓
Construction of New Economy Parking Lot	-	-	-	-	✓

Source: McFarland Johnson, 2018.

The following input assumptions regarding development projects and associated activity were utilized to estimate increases to GSP operating revenues for the short-term period (FY 2019-2023):

- **Revenues from Expanded Air Cargo Apron and Land Lease:** The forecast assumes that the expanded air cargo apron described in the Airport CIP in *Chapter 7, Implementation Plan,* can accommodate three widebody air cargo aircraft (747-400F/8F or similar) simultaneously, and that cargo tonnage and operations will increase annually as detailed in *Chapter 3, Forecasts*. It is assumed that construction will occur in 2020, with impacts to landing fee revenues beginning in 2021. As a conservative measure, the existing landing fee rate of $1.58 per 1,000 pounds of landed weight was used in the forecast rather than incorporating another assumption about the landing fee rate in 2021. Following these assumptions, landing fees are forecast to increase by about $500,000 in 2021 to roughly $555,000 in 2023 in concert with a steady increase of 300 operations annually over baseline levels.

  Also included is an estimate that a ground lease for a cargo hangar and associated auto parking will produce approximately $180,000 in rental payments beginning in year 2023. The estimate assumes a 400,000-square-foot site will lease at a rate of $0.45 per square foot.

- **Revenues and Expenses from Added Passenger Auto Parking Facilities:** The forecast assumes that revenues from passenger auto parking will increase in concert with increasing enplanement levels detailed in *Chapter 3, Forecasts.* The addition of three parking facilities described in the Airport CIP in *Chapter 7, Implementation Plan,* will consist of approximately 2,250 parking spaces: Garage C (1,500 spaces), expanded existing economy lot (250 spaces), and a new economy lot (500 spaces). The forecast estimates revenues from these facilities by utilizing net revenue per parking space contained in the GSP FY 2019 approved operating budget. This is a reasonable metric for forecasting auto parking revenues because it normalizes budgeted revenues across a variety of existing parking

facilities and parking duration, some of which command a premium over economy rates and make forecasting parking receipts per passenger complex. Following these assumptions, parking revenues are forecast to increase from $1.5 million in 2021 to more than $7.2 million in 2023.

The forecast also incorporates the Airport District's estimates for operations and maintenance of these new parking facilities, including the operation of a shuttle bus to service the new economy parking lot. Operating and maintenance expenses for these facilities are forecasted to grow from $656,000 in 2021 to more than $1.8 million in 2023.

Table 8-8 presents a forecast of enhanced operating financial performance for GSP based upon these assumptions.

Table 8-8: Forecast of Preferred Development Operating Financial Performance

Category	2019	2020	2021	2022	2023
Operating Revenues					
Landing & Other Airside Fees	$3,202,640	$3,475,000	$4,273,334	$4,619,889	$4,995,047
Space & Ground Rental Fees	$10,927,865	$11,075,000	$11,224,116	$11,375,239	$11,528,397
Concessions Revenue	$ 17,401,439	$ 18,825,000	$ 21,942,036	$ 26,915,450	$ 31,491,670
Expense Reimbursements	$1,656,479	$1,750,000	$1,848,801	$1,953,181	$2,063,453
Other Revenue	$3,435,324	$4,010,111	$4,234,071	$4,475,082	$4,915,033
Gross Profit on Fuel	$4,137,550	$4,885,000	$5,373,500	$5,910,850	$6,501,935
Total	**$40,761,297**	**$44,020,111**	**$ 48,895,858**	**$ 55,249,691**	**$ 61,495,534**
Operating Expenses					
Salary & Benefits	$14,080,805	$14,714,441	$15,376,591	$16,068,537	$16,791,621
Professional Services	$526,105	$552,410	$580,031	$609,032	$639,484
Promotional Activities	$1,526,645	$1,595,344	$1,667,135	$1,742,156	$1,820,553
Administrative	$1,499,228	$1,604,174	$1,716,466	$1,836,619	$1,965,182
Insurance	$679,051	$732,696	$790,579	$853,034	$920,424
Contractual Services	$4,300,536	$4,494,060	$4,696,292	$4,907,626	$5,128,469
Rentals & Leases	$519,490	$555,854	$594,764	$636,398	$680,945
Repairs & Maintenance	$824,878	$890,043	$1,616,687	$2,821,333	$2,956,748
Supplies & Equipment	$1,533,212	$1,640,537	$1,755,374	$1,878,250	$2,009,728
Utilities	$1,908,549	$2,042,148	$2,185,098	$2,338,055	$2,501,719
Total	**$27,398,498**	**$28,821,706**	**$30,979,017**	**$33,691,040**	**$35,414,873**
Net Income/(Deficit)	**$13,362,799**	**$15,198,405**	**$17,916,841**	**$21,558,651**	**$26,080,661**

Source: McFarland Johnson, 2018.

As shown in Table 8-8, enhanced financial performance of the Airport can produce increases to net income, with performance over baseline beginning in 2021 as revenue-producing activities are implemented. The forecast represents for a cumulative impact of nearly $11 million over the Baseline Forecast, with cumulative net income before depreciation, pension expense, and losses

on disposal of assets of more than $94 million. A summary of the Airport's operating financial performance forecast under the preferred alternative is presented in Table 8-9.

Table 8-9: Forecast of Airport Operating Financial Performance – Preferred Alternative
Net Operating Income/(Deficit) Summary

Year	Preferred Operating Revenues	Preferred Operating Expenses	Net Operating Income
2019	$40,761,297	$27,398,498	$13,362,799
2020	$44,020,111	$28,821,706	$15,198,405
2021	$48,895,858	$30,979,017	$17,916,841
2022	$55,249,691	$33,691,040	$21,558,651
2023	$61,495,534	$35,414,873	$26,080,661

Source: McFarland Johnson, 2018.

8.3. SUMMARY OF THE SHORT-TERM CAPITAL PROGRAM FUNDING FEASIBILITY

The purpose of this section is to determine the Airport's ability to fund the local match of FAA-approved projects in the short-term, 5-year period. As stated at the outset of this chapter and shown in Table 8-1, the short-term local funding need is just over $73.3 million. Based on the forecast presented in Table 8-10, net operating income is forecasted to surpass $94.1 million during the same period. While these estimates indicate a net surplus for the 2019-2023 period, this includes assumptions about project funding eligibility under the AIP program and a large number of significant landside roadways, parking, FBO, and terminal improvements that are anticipated to be self-funded by the Airport District.

Table 8-10 presents a summary of forecasted financial performance for GSP that includes non-operating revenues and expenses such as state and federal capital grants, PFC collections, and PFC program application/administration. Non-operating expenses include the Airport District's share of AIP eligible and non-AIP, self-funded projects. Revenue from PFC collections is based upon forecasted revenue enplanements for the period as presented in *Chapter 3, Forecasts*, and is proposed to be restarted in 2020.

Table 8-10: Estimated ACIP Short Term Local Funding Need &
Capital Funding Feasibility

Source	2019	2020	2021	2022	2023	Total
Preferred Development Operating Performance						
Net Operating Income	$13,362,799	$15,198,405	$17,916,841	$21,558,651	$26,080,661	$94,117,357
Non-Operating Revenues						
PFC Collections	-	$4,907,930	$5,028,424	$5,151,877	$5,278,361	$20,366,592
State Capital Grant Received	$389,492	$984,341	$701,316	$457,041	$588,832	$3,121,022
Federal Capital Grants Received	$7,010,852	$17,718,143	$12,623,681	$8,226,743	$10,598,972	$56,178,389
Total	$7,400,343	$23,610,414	$18,353,421	$13,835,661	$16,466,164	$79,666,003

Source	2019	2020	2021	2022	2023	Total
Operating Income, PFC Collections & Grant Revenues						
Net Revenues	$20,763,142	$38,808,818	$36,270,262	$35,394,312	$42,546,825	$173,783,360
Non-Operating Expenses						
PFC Application & Ongoing Administration	$45,000	$15,000	$15,000	$15,000	$15,000	$105,000
Professional Services	$1,615,000	$3,768,680	$5,842,520	$2,850,000	$9,429,000	$23,505,200
Construction Costs	$6,995,835	$28,187,380	$34,292,313	$20,962,025	$39,663,525	$130,101,078
Total	$8,655,835	$31,971,060	$40,149,833	$23,827,025	$49,107,525	$153,711,278
Grand Total Net Income/(Deficit)	$12,107,307	$6,837,758	-$3,879,570	$11,567,287	-$6,560,700	$20,072,082
Rolling Balance	$12,107,307	$18,945,066	$15,065,496	$26,632,782	$20,072,082	-

Source: McFarland Johnson, 2018.

As indicated, anticipated passenger activity at GSP will result in PFC collections for the short-term period could surpass $20.3 million. The projection of cash flows from PFC collections assumes a rate of $4.50 per enplanement, which is offset nominally to account for PFC program administrative expenses and is adjusted to reflect the portion retained by the airlines ($0.11 per passenger).

The analysis presented in this chapter demonstrates that with the approval of a PFC program, the combination of operating income, PFC collections, and state and federal grants makes the feasibility for implementing the ACIP program at GSP is positive.

8.4. AIRPORT GOVERNANCE AND POLICY CONSIDERATIONS

Finally, this section briefly addresses Airport's governance structure and policies that can have a significant impact on revenue generation.

8.4.1. Airport Governance and Financial Structure

The Greenville-Spartanburg Airport Commission (Commission) is the governing body of the Greenville-Spartanburg Airport District, which operates Greenville-Spartanburg International Airport. The Commission is composed of six members who are appointed by the Governor. Three of the members must be residents of Spartanburg County and each must receive the recommendation of the majority of the Spartanburg County Legislative Delegation. Three of the members must be residents of Greenville County and each must receive the recommendation of the majority of the Greenville County Legislative Delegation. Members of the Commission serve a six-year term and can be reappointed.

The District is established as a political and incorporated subdivision of the State by South Carolina Code of Laws, Title 55 – Aeronautics, Chapter 11 Particular Airports, Article 3 Greenville and Spartanburg Counties. As established, there are no structural obstacles to funding and/or financing vehicles available that may hamper the long-term ability of the Airport to implement much-needed facility improvements and capitalize on growth opportunities.

It is incumbent upon the Commission to monitor and assess the ability of existing policies, fees, rates, and charges, and use and lease agreements on an annual basis. Doing so can ensure that terms reflect the best interests of the Airport District and can aid in achieving a level of financial performance that can fund and/or finance the short- and long-term needs of the Airport.

8.4.2. Commercial and General Aviation Business Policies

GSP maintains policies that provide structure to the operating environment at the Airport and protect the interests of the Airport and the public. These policies govern the operations of airlines providing scheduled commercial passenger service and general aviation businesses offering services to aircraft operators and the public. At GSP, policies include rules and regulations, minimum standards, and lease and use agreements with airlines, other aeronautical business tenants, and non-aeronautical tenants. A cursory review of these policies was performed and is summarized in the following sections.

Rules and Regulations

The GSP Commission adopted Rules and Regulations in May 2015, which govern all persons and businesses coming to or using the Airport and property. The Rules established are for the safe and efficient operation of the Airport and address the following:

- Commercial Activity
- Designated and Restricted Areas
- Aircraft Operations
- Movement and Non-Movement Area Operations
- Motor Vehicle and Traffic Rules
- Passenger Screening and SIDA (Security Identification Display Area) Access
- Conduct of the Public
- Picketing, Leaflet Distribution, and Solicitation

The Commercial Activity Section of the Rules requires entities interested in operating a business at GSP to have a written agreement or written consent to do so, and requires payment of applicable fees, charges, and rent prescribed by the Airport District.

Minimum Standards

The objective of minimum standards as set forth in FAA Advisory Circular 150/5190-7, *Minimum Standards for Commercial Aeronautical Activities,* is to promote safety in all airport activities, protect airport users from unlicensed and unauthorized products and services, maintain and enhance the availability of adequate services for all Airport users, promote the orderly development of airport land, and ensure efficiency of operations. Additionally, for public-use airports that accept federal grants through the FAA's AIP program, minimum standards also aid

those airports in complying with FAA grant assurances pertaining to Economic Discrimination (Grant Assurance 22) and Exclusive Rights (Grant Assurance 23).

Minimum standards at GSP set the threshold of entry for current and future operators, such that they are applied objectively and uniformly, and avail the opportunity to any entity that can meet the standards provided suitable space is available for the conduct of the operation.

8.4.3. Use and Lease Agreements

The Airport District has a variety of use and lease agreements with aeronautical and non-aeronautical users operating businesses on the Airport. These agreements stipulate rights and obligations of each party over an agreed-upon term for the use of land and/or facilities. A snapshot of current parties to GSP leases include:

- FedEx
- CenterPoint Properties (BMW)
- Rental Car Agencies
- Airlines (Terminal Areas)
- Non-Airlines (Miscellaneous Ground Leases/Hangars)

Importantly, every use and lease agreement include components that detail the obligation of the lessee to pay the Airport District for use of the Airport's facilities. In addition to rent for use of facilities, a very important component in lease agreements is to ensure that the proper additional rent and/or percentage rent is accounted for. Additional rent typically includes a provision that lessee's pay some their pro-rated share of operating expenses (e.g., a triple-net lease), utilities, common area maintenance, and taxes or payments-in-lieu of taxes. Percentage rent is common for aeronautical and non-aeronautical operators to pay, which is comprised of some percentage of lessee's gross receipts as a means to remunerate the lessor for attracting and/or maintaining passenger levels that support the tenant or non-tenant's business.

9. ALP Summary

The Airport Layout Plan (ALP) Drawing Set has been prepared in accordance with generally accepted airport planning practices and Federal Aviation Administration (FAA) guidance materials, including the following:

- FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*
- FAA AC 150/5300-13A, *Airport Design*
- FAA AC 150/5360-13A, *Airport Terminal Planning*
- Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*
- FAA Standard Operating Procedures (SOP) ALP Checklist

The ALP Drawing Set for Greenville-Spartanburg International Airport (GSP or the Airport) consists of a coversheet and 17 drawings as follows:

Sheet No.	Title
-	Cover Sheet
1	Existing Airport Layout
2	Airport Layout Plan
3	Airport Data Sheet
4	Terminal Area Plan
5	Airport Airspace Plan
6	Outer Airport Airspace Plan
7	Inner Approach Plan Runway 4
8	Inner Approach Plan Runway 22
9	Inner Approach Plan Runway 4R
10	Inner Approach Plan Runway 22L
11	Departure Surface Plan Runway 22
12	Departure Surface Plan Runway 4
13	Departure Surface Plan Runway 22L
14	Departure Surface Plan Runway 4R
15	Airport Land Use and RPZ Control Plan
16	Airport Property Map
17	Airport Property Map Tables

Reduced size versions of each ALP sheet are presented at the end of this section.

9.1. COVER SHEET

The *Cover Sheet* provides identifying information for the ALP Drawing Set. This information includes a drawing index listing each of the sheets within the set, as well as the specific FAA project number and information on the preparer of the document. Two maps are also placed on the cover sheet to identify the location of the Airport within the context of the State of South Carolina (location map) and the area immediately adjacent to the airport (vicinity map).

9.2. EXISTING AIRPORT LAYOUT

The *Existing Airport Layout* provides the current configuration and existing airport facilities at GSP. Details shown include airport buildings, airport infrastructure, local roads and neighborhoods, property lines, and water bodies on or adjacent to GSP. These details are based on aerial photography and photogrammetric mapping obtained as part of this study effort.

This sheet also serves as a base upon which development proposed within this Master Plan Update is placed upon. The current dimensions of the airside and landside facilities are depicted within the sheet, as well as the dimensions of applicable FAA safety and object free areas, protection zones, and other dimensions relevant to airport design. The sheet also includes a facilities table and a title and revision block, as required.

9.3. AIRPORT LAYOUT PLAN

The *Airport Layout Plan* illustrates the recommended proposed development at GSP over the twenty-year planning period. The Airport Layout Plan sheet is the culmination of the Master Plan Update processes and is the most important sheet in the ALP Drawing Set. The ALP is a legal document used by the FAA to allocate federal grant funding and approve the use of Passenger Facility Charges (PFC) for projects depicted. The document is approved and signed by the FAA, South Carolina Aeronautics Commission, and the GSP Airport District.

The projects depicted on the *Airport Layout Plan* are intended to cover a twenty-year period and are phased over this period based on the sponsor's priority and forecasted demand. Four time periods have been defined within the Master Plan Update: Phase I (2019 – 2023), Phase II (2024 – 2028), Phase III (2029 – 2038), and Phase IV (2039 and beyond).

9.4. AIRPORT DATA SHEET

The *Airport Data Sheet* displays several tables that are typically placed on the *Airport Layout Plan* sheet. However, due to size constraints and the need to clearly show the existing facilities and proposed development on the *Airport Layout Plan* sheet, these tables have been placed on a dedicated sheet within the ALP Drawing Set. Tables on the sheet include the Runway Data Table, Airport Data Table, Runway Safety Area Determination, Wind Coverage, Declared Distances, and Modifications to Design Standards.

9.5. TERMINAL AREA PLAN

Due to the significant number of changes proposed within the terminal area, a *Terminal Area Plan* has been included at a scale to clearly illustrate all of the changes that have been proposed within vicinity. The *Terminal Area Plan* depicts the proposed terminal area development at a scale of 1":150', as opposed to the scale of the *Airport Layout Plan* sheet at 1":600'.

9.6. AIRPORT AIRSPACE PLANS

Title 14 of the CFR, Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, regulates the airspace surrounding airports through the development of five "Imaginary Surfaces." These surfaces include the primary surface, the approach surface, the transitional surface, the Horizontal Surface, and the Conical Surface. The *Airport Airspace Plan* of the ALP Drawing Set

depicts the existing and future 14 CFR Part 77 imaginary surfaces based on the existing and proposed conditions at GSP. Modifications proposed on the *Airport Layout Plan* sheet and throughout the Master Plan Update are appropriately accounted for on the *Airport Airspace Plans*. The *Outer Approach Plan* sheet shows the extents of these surfaces.

9.6.1. Primary Surface

This surface is a rectangle aligned with the centerline of the runway and extends 200 feet from each runway end. The width of the primary surface varies depending on the type of runway and could be anywhere from 250 to 1,000 feet. At GSP, existing Runway 4-22 and the proposed Runway 4R-22L have a primary surface with a width of 1,000 feet.

9.6.2. Transitional Surface

The transitional surface is constructed to join the primary, approach, and horizontal surfaces. It starts at the edges of the primary surface and extends outwards and upwards from the primary and approach surfaces at a slope of 7:1 to an elevation 150 feet above the airport elevation, where it meets the horizontal surface.

9.6.3. Approach Surface

The approach surfaces are aligned longitudinally with each runway end starting at the edge of the primary surface (200 feet from each runway end) and extending outward and upward in a trapezoidal fashion. At GSP, existing Runways 4, 22 and proposed 4R, and 22L have precision approaches. Therefore, each runway has an approach surface that extends from the primary surface out 50,000 feet to a width of 16,000 feet. The first 10,000 feet climb at a slope of 50:1 (50 feet horizontally for one foot vertically) and the next 40,000 feet climb at a slope of 40:1.

9.6.4. Horizontal Surface

The horizontal surface is a horizontal plane at 150 feet above the airport elevation. It is constructed by swinging arcs around the end of the primary surface, which are connected via tangential lines. The horizontal surface radius is 5,000 feet for visual runways or for non-precision instrument runways serving only utility aircraft (small aircraft less than 12,500 pounds). For all larger runways, the horizontal surface has a radius of 10,000 feet. GSP's horizontal surface will extend 10,000 feet from the ends of existing Runway 4-22 and proposed Runway 4R-22L. The Airport's horizontal surface elevation is 1,135 feet above mean sea level.

9.6.5. Conical Surface

The conical surface extends beyond the horizontal surface for 4,000 feet at a slope of 20:1.

9.7. INNER APPROACH PLANS

Inner Approach Plan Runway 4, Inner Approach Plan Runway 22, Inner Approach Plan Runway 4R, Inner Approach Plan Runway 22L depict close-in obstructions to the existing and proposed 14 CFR Part 77 primary, approach, and transitional surfaces, as well as surfaces #5 and #6 defined in the

Approach/Departure Standards Table as published in Table 3-2[1] of FAA AC 150/5300-13A (Change 1), *Airport Design*, and precision approach path indicator (PAPI) obstacle clearance surfaces for each runway. These sheets both incorporate the precision approach procedures for existing Runways 4 and 22. As no significant changes are recommended with regards to the approach procedures or to the longitudinal dimensions of the runway, the existing surfaces will be maintained through the planning period. Additionally, inner approach plans were prepared for the proposed Runway 4R-22L.

Existing Runway 4-22 was found to have several obstructions to its primary and transitional surfaces. Neither existing Runway 4 or Runway 22, however, have identified obstructions to its approach surface or either of its airport design surfaces.

Initial analysis of proposed Runway 4R-22L indicates that, based on its planned elevation, only two transitional surface obstructions would exist and that there would be no impact to either the Runway 4R or 22L Part 77 approach surfaces or the runway's respective airport design surfaces. Future development of a fly-over to provide a northbound on-ramp to I-85 from Aviation parkway is not anticipated to present an airspace concern.

9.8. DEPARTURE SURFACE PLANS

The *Departure Surface Plan Runway 4* and *Departure Surface Plan Runway 22* reveal obstructions to the 40:1 sloped departure surface as defined by Table 3-2 of FAA Advisory Circular 150/5300-13A (Change 1), *Airport Design.* These plans are required for each runway that is designated for instrument departures. When departure surfaces are clear of obstructions pilots can follow standard departure procedures. Obstacles, however, frequently penetrate the departure surface and may dictate non-standard climb rates, and/or higher departure minimums. Therefore, it is important for airports to identify and remove these obstacles whenever possible.

Based on current mapping the existing Runway 4 departure surface has two tree obstructions originating from a grouping of trees within Airport owned land south of South Carolina Highway 14. The existing Runway 22 departure surface also has two tree obstructions on Airport owned land, north of South Carolina Highway 101. These departure surface obstructions should be mitigated though trimming or removal.

Future Runway 4R-22L has no identified obstructions to either of its runway's proposed departure surfaces.

9.9. AIRPORT LAND USE AND RPZ CONTROL PLAN

The *Airport Land Use and RPZ Control Plan* provides general guidance for future land development on-airport as well as in the vicinity of airport property. Since aircraft noise is a major factor influencing land use compatibility, the FAA's Aviation Environmental Design Tool (AEDT) was used to predict noise levels in the year 2037 based upon aviation activity included within the approved

[1] The revised Table 3-2 of FAA AC 150/5300-13A (Change 1), *Airport Design* as shown in Engineering Brief (EB) No. 99 *Changes to Tables 3-2 and 3-4 of Advisory Circular 150/5300-13A, Airport Design* was used for all approach and departure sheets.

forecasts. The resultant noise contours are included in the sheet along with the Airport's Environs Zone.

The AEDT model estimates aircraft noise levels in decibels (dB) at ground level. Noise levels are quantified according to the A-weighted scale (which approximates the range of human hearing) using the Day-Night Average Level (DNL). A DNL of 65 dB (decibel) is considered by the FAA to be the threshold of impact for noise sensitive areas. The AEDT output includes noise contours, which are lines of equal loudness, with the highest levels centered on the runway and the quieter levels expanding outward. As shown on the Airport Land Use and RPZ Control Plan, the future noise contours for existing Runways 4-22 and proposed 4R-22L at 65 DNL is on airport property except for three small areas which fall over roadways located beneath the approach zones of the runways.

Additionally, this sheet of the ALP set details all parcels not currently owned by the Airport but within the limits of any of the Airport's existing or future runway protection zones (RPZ) and expresses the preferred action for each in the future. However, with the exception of right-of-way provided to public roadways surrounding the Airport, GSP owns all land within each of the two existing RPZs as well as the two proposed RPZs.

9.10. AIRPORT PROPERTY MAP

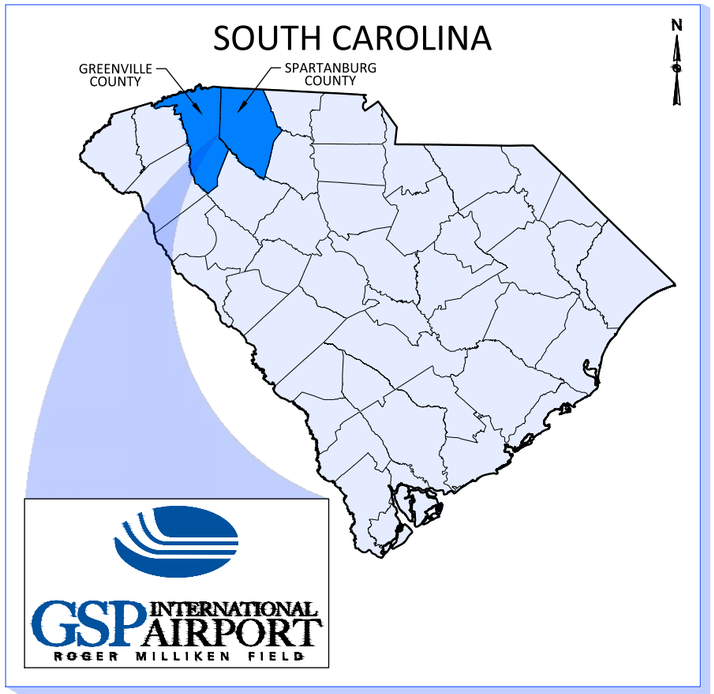
The *Airport Property Map* illustrates the Airport's current property boundaries. The property map depicts the existing land area that currently comprises the entire Airport. Additionally, all properties and easements surrounding the Airport that have been acquired to date are provided in their respective tables and include a numerical identifier, tax parcel number, book and page information, acreage, acquisition date (if available), the AIP number (for land acquired using AIP funds), as well as the AIP acreage and the date of the AIP grant on the *Airport Property Map Tables*. The plan also depicts the proposed land to be acquired in fee, as well as the parcels where the acquisition of avigation easements is proposed. The proposed acquisitions are listed in separate tables.

This page has been intentionally left blank.

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN UPDATE

GREER, SOUTH CAROLINA

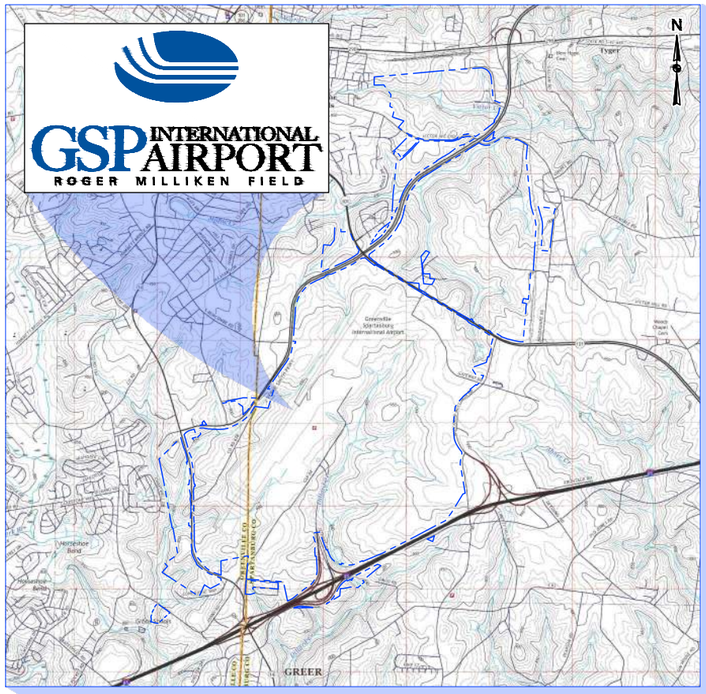
JANUARY 2020



LOCATION MAP

DRAWING INDEX

SHEET NO.	TITLE
1	EXISTING AIRPORT LAYOUT
2	AIRPORT LAYOUT PLAN
3	AIRPORT DATA
4	TERMINAL AREA PLAN
5	AIRPORT AIRSPACE PLAN
6	OUTER AIRPORT AIRSPACE PLAN
7	INNER APPROACH PLAN RUNWAY 4L
8	INNER APPROACH PLAN RUNWAY 22R
9	INNER APPROACH PLAN RUNWAY 4R
10	INNER APPROACH PLAN RUNWAY 22L
11	DEPARTURE SURFACE PLAN RUNWAY 22R
12	DEPARTURE SURFACE PLAN RUNWAY 4L
13	DEPARTURE SURFACE PLAN RUNWAY 22L
14	DEPARTURE SURFACE PLAN RUNWAY 4R
15	AIRPORT LAND USE AND RPZ CONTROL PLAN
16	EXHIBIT 'A' AIRPORT PROPERTY INVENTORY MAP
17	EXHIBIT 'A' AIRPORT PROPERTY INVENTORY MAP TABLES



VICINITY MAP

PREPARED FOR:

GREENVILLE-SPARTANBURG AIRPORT DISTRICT

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

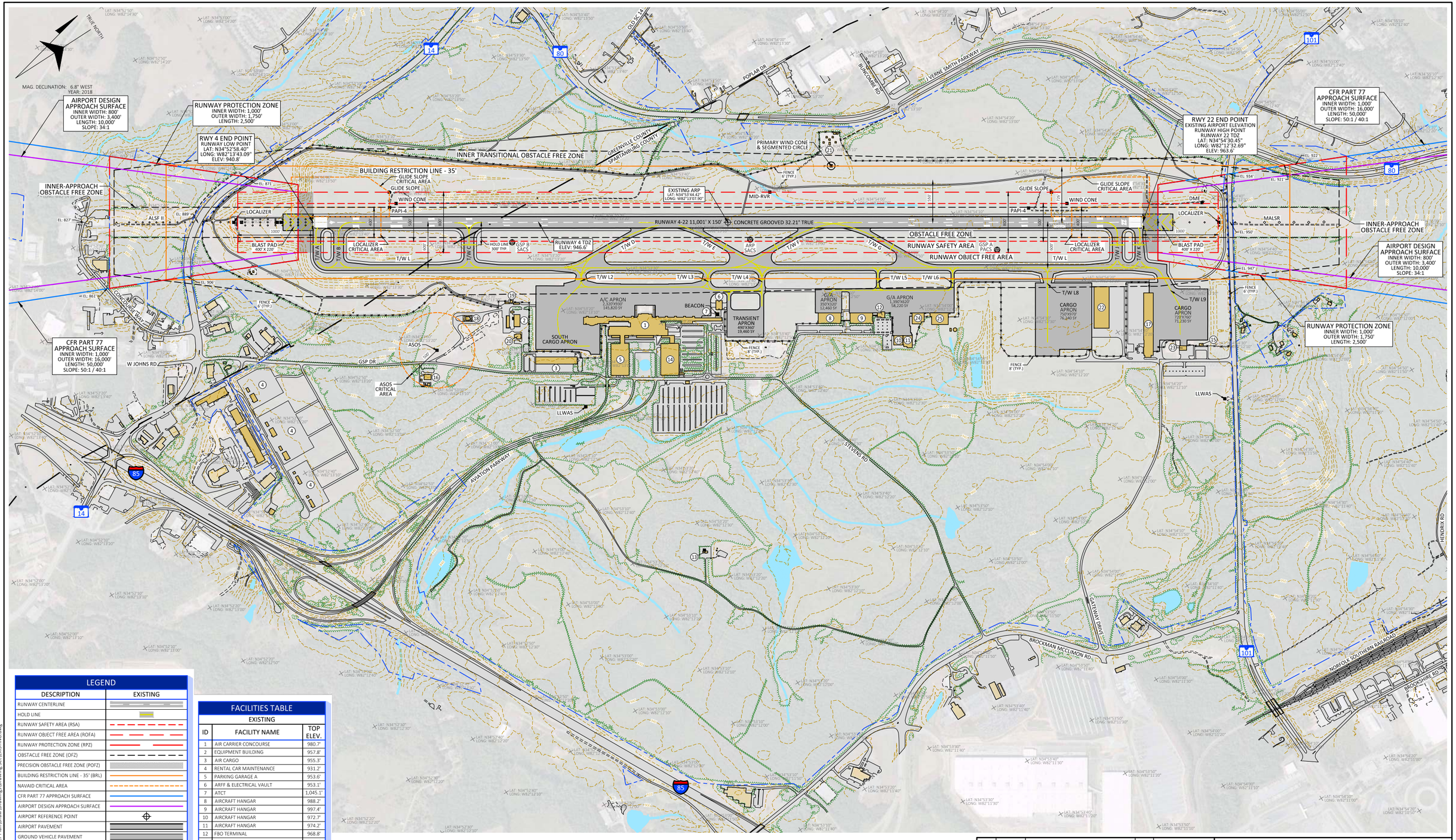
FAA AIP PROJECT NO. 3-45-0028-053-2017
MCFARLAND JOHNSON PROJECT NO. 18219.00

PREPARED BY:

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

K:\Greenville Spartanburg\T--18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\COVER.dwg

This page has been intentionally left blank.



LEGEND

DESCRIPTION	EXISTING
RUNWAY CENTERLINE	
HOLD LINE	
RUNWAY SAFETY AREA (RSA)	
RUNWAY OBJECT FREE AREA (ROFA)	
RUNWAY PROTECTION ZONE (RPZ)	
OBSTACLE FREE ZONE (OFZ)	
PRECISION OBSTACLE FREE ZONE (POFZ)	
BUILDING RESTRICTION LINE - 35' (BRL)	
NAVAID CRITICAL AREA	
CFR PART 77 APPROACH SURFACE	
AIRPORT DESIGN APPROACH SURFACE	
AIRPORT REFERENCE POINT	
AIRPORT PAVEMENT	
GROUND VEHICLE PAVEMENT	
ON-AIRPORT BUILDINGS	
OFF-AIRPORT BUILDINGS	
TO BE REMOVED	N/A
AIRPORT PROPERTY	
COUNTY BOUNDARY	
NGS MONUMENT	
FENCE	
TREE LINE	
GROUND ELEVATION CONTOURS (10')	
WATER	

FACILITIES TABLE

EXISTING

ID	FACILITY NAME	TOP ELEV.
1	AIR CARRIER CONCOURSE	980.7'
2	EQUIPMENT BUILDING	957.8'
3	AIR CARGO	955.3'
4	RENTAL CAR MAINTENANCE	931.2'
5	PARKING GARAGE A	953.6'
6	ARFF & ELECTRICAL VAULT	953.1'
7	ATCT	1,045.1'
8	AIRCRAFT HANGAR	988.2'
9	AIRCRAFT HANGAR	997.4'
10	AIRCRAFT HANGAR	972.7'
11	AIRCRAFT HANGAR	974.2'
12	FBO TERMINAL	968.8'
13	ASR	959.3'
14	PARKING GARAGE B	953.6'
15	FEDERAL INSPECTION FACILITY	974.1'
16	NWS FORECAST OFFICE	958.3'
17	FEDEX CARGO	992.3'
18	FUEL FARM	947.2'
19	DEICE & UNLEADED/DIESEL FUEL FARM	953.6'
20	MAINTENANCE OFFICE	948.7'
21	ANTENNA FARM	1,041.2'
22	AIR CARGO	998.0'
23	UPS CARGO	983.5'
24	AIRCRAFT HANGAR	985.0'
25	AIRCRAFT HANGAR	995.0'

SCALE

0 600 1200 1800 2400

FEET

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

GREER, SOUTH CAROLINA

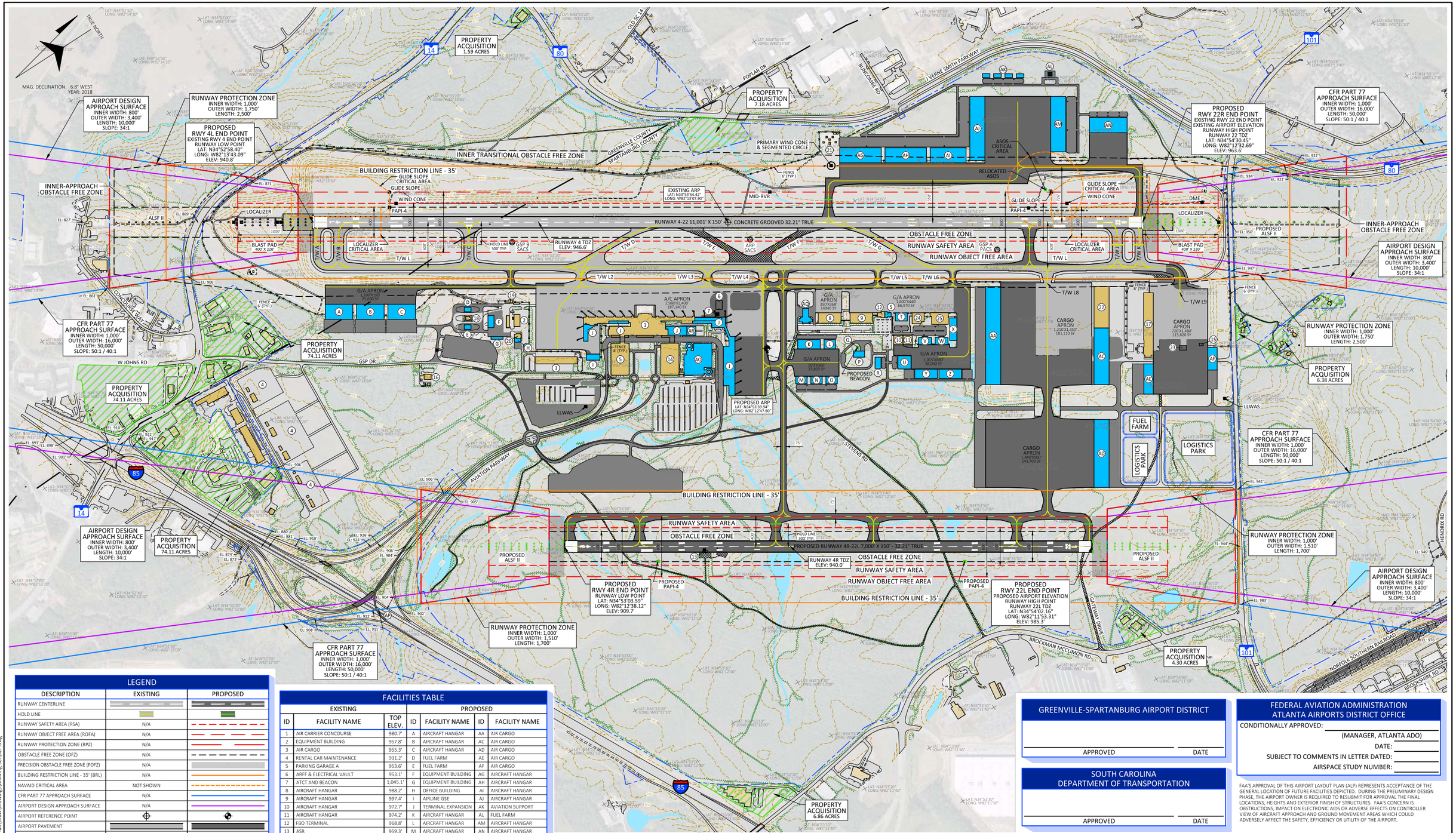
EXISTING AIRPORT LAYOUT

SCALE:	1" = 600'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 1

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\EXISTING.dwg

This page has been intentionally left blank.



LEGEND

DESCRIPTION	EXISTING	PROPOSED
RUNWAY CENTERLINE		
HOLD LINE		
RUNWAY SAFETY AREA (RSA)	N/A	
RUNWAY OBJECT FREE AREA (ROFA)	N/A	
RUNWAY PROTECTION ZONE (RPZ)	N/A	
OBSTACLE FREE ZONE (OFZ)	N/A	
PRECISION OBSTACLE FREE ZONE (POFZ)	N/A	
BUILDING RESTRICTION LINE - 35' (BRL)	N/A	
NAVAID CRITICAL AREA	NOT SHOWN	
CFR PART 77 APPROACH SURFACE	N/A	
AIRPORT DESIGN APPROACH SURFACE	N/A	
AIRPORT REFERENCE POINT		
AIRPORT PAVEMENT		
GROUND VEHICLE PAVEMENT		
ON-AIRPORT BUILDINGS		
OFF-AIRPORT BUILDINGS		SAME
TO BE REMOVED	N/A	
AIRPORT PROPERTY		
COUNTY BOUNDARY		SAME
NGS MONUMENT		SAME
FENCE		SAME
TREE LINE		SAME
GROUND ELEVATION CONTOURS (10')		SAME
WATER		SAME

FACILITIES TABLE

EXISTING ID	EXISTING FACILITY NAME	TOP ELEV.	PROPOSED ID	PROPOSED FACILITY NAME	PROPOSED ID	PROPOSED FACILITY NAME
1	AIR CARRIER CONCOURSE	980.7'	A	AIRCRAFT HANGAR	AA	AIR CARGO
2	EQUIPMENT BUILDING	957.8'	B	AIRCRAFT HANGAR	AC	AIR CARGO
3	AIR CARGO	955.3'	C	AIRCRAFT HANGAR	AD	AIR CARGO
4	RENTAL CAR MAINTENANCE	931.2'	D	FUEL FARM	AE	AIR CARGO
5	PARKING GARAGE A	953.6'	E	FUEL FARM	AF	AIR CARGO
6	ARFF & ELECTRICAL VAULT	953.1'	F	EQUIPMENT BUILDING	AG	AIRCRAFT HANGAR
7	ATCT AND BEACON	1,045.1'	G	EQUIPMENT BUILDING	AH	AIRCRAFT HANGAR
8	AIRCRAFT HANGAR	988.2'	H	OFFICE BUILDING	AI	AIRCRAFT HANGAR
9	AIRCRAFT HANGAR	997.4'	I	AIRLINE GSE	AJ	AIRCRAFT HANGAR
10	AIRCRAFT HANGAR	972.7'	J	TERMINAL EXPANSION	AK	AVIATION SUPPORT
11	AIRCRAFT HANGAR	974.2'	K	AIRCRAFT HANGAR	AL	FUEL FARM
12	FBO TERMINAL	968.8'	L	AIRCRAFT HANGAR	AM	AIRCRAFT HANGAR
13	ASR	959.3'	M	AIRCRAFT HANGAR	AN	AIRCRAFT HANGAR
14	PARKING GARAGE B	953.6'	N	AIRCRAFT HANGAR	AO	PARKING GARAGE C
15	FEDERAL INSPECTION FACILITY	974.1'	O	AIRCRAFT HANGAR	AP	NB I85 FLYOVER
16	NWS FORECAST OFFICE	958.3'	P	ATCT OFFICE	AQ	ARFF
17	FEDEX CARGO	992.3'	Q	ATCT AND BEACON	AR	ON-AIRPORT HOTEL SITE
18	FUEL FARM	947.2'	R	AVIATION SUPPORT		
19	DEICE & UNLEADED/DIESEL FUEL FARM	953.6'	S	FBO EXPANSION		
20	MAINTENANCE OFFICE	948.7'	T	AIRCRAFT HANGAR		
21	ANTENNA FARM	1,041.2'	U	AIRCRAFT HANGAR		
22	AIR CARGO	998.0'	V	AIRCRAFT HANGAR		
23	UPS CARGO	983.5'	W	AIRCRAFT HANGAR		
24	AIRCRAFT HANGAR	985.0'	X	AIRCRAFT HANGAR		
25	AIRCRAFT HANGAR	995.0'	Y	AIRCRAFT HANGAR		
			Z	AIRCRAFT HANGAR		

NOTES:

- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- CLEARWAY AND STOPWAY ARE APPLIED AT GSP.
- "NO-ENTRY" SIGN TO BE CONSIDERED WEST OF T/W L ACROSS FROM L2 FOR RIM PURPOSES.
- RUNWAY 4R RPZ LAND USE INCOMPATIBILITY TO BE FUTHER EVALUATED.

GREENVILLE-SPARTANBURG AIRPORT DISTRICT

APPROVED DATE

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

APPROVED DATE

FEDERAL AVIATION ADMINISTRATION
ATLANTA AIRPORTS DISTRICT OFFICE

CONDITIONALLY APPROVED: _____
(MANAGER, ATLANTA ADO)
DATE: _____
SUBJECT TO COMMENTS IN LETTER DATED: _____
AIRSPACE STUDY NUMBER: _____

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED. DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACH AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY OR UTILITY OF THE AIRPORT.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, MIRROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjmc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

AIRPORT LAYOUT PLAN

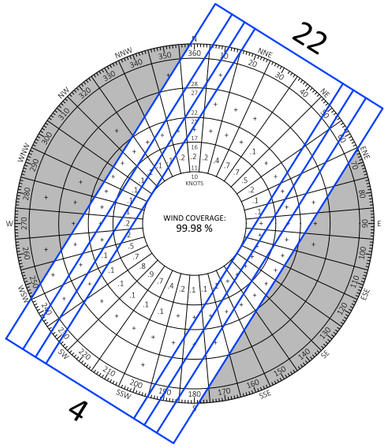
SCALE:	1" = 600'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 2

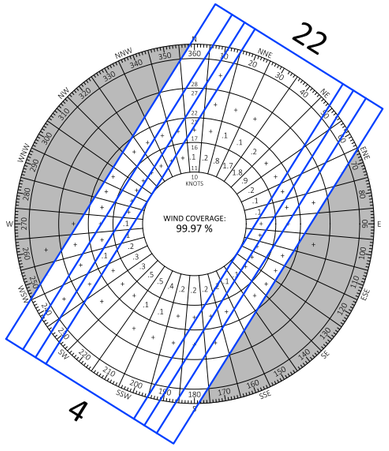
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\ALP.dwg

This page has been intentionally left blank.

WIND COVERAGE



ALL WEATHER WINDROSE



IFR WINDROSE

SOURCE:
NATIONAL CLIMACTIC DATA CENTER
723120 GREER, SC; 2008-2017

WIND COVERAGE

KNOTS	ALL WEATHER	IFR
10.5	98.15%	99.55%
13.0	99.18%	99.29%
16.0	99.78%	99.78%
20.0	99.95%	99.93%

AIRPORT DATA TABLE

ITEM		EXISTING	PROPOSED
AIRPORT REFERENCE CODE (ARC)		D-V	D-VI
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		91° F	SAME
AIRPORT ELEVATION		963.6'	985.3'
AIRPORT NAVIGATIONAL AIDS		LOC, GS, PAPI4, REILS, ALSF II, MALSR, BEACON	LOC, GS, PAPI4, REILS, ALSF II, BEACON
AIRPORT REFERENCE POINT	LATITUDE	N34°53'44.42"	N34°53'39.94"
	LONGITUDE	W82°13'07.90"	W82°12'47.60"
MISCELLANEOUS FACILITIES		ASOS, LIGHTED WIND CONE	SAME
CRITICAL AIRCRAFT		B 747-4F	B 747-8F
MAGNETIC VARIATION (SOURCE: NGS, 2018)		6.8° W	SAME
NPIAS SERVICE LEVEL		SMALL HUB	SAME
STATE SERVICE LEVEL		COMMERCIAL SERVICE	SAME
COMBINED WIND COVERAGE (%)	ALL WEATHER	20.0 KNOTS - 99.95%	SAME
	IFR	20.0 KNOTS - 99.93%	SAME
TAXIWAY / TAXILANE WIDTH		75'	SAME
TAXIWAY / TAXILANE SAFETY AREA (TSA) WIDTH		214'	262'
TAXIWAY OBJECT FREE AREA (TOFA) WIDTH		320'	386'
TAXILANE OBJECT FREE AREA (TLOFA) WIDTH		276'	334'
TAXIWAY EDGE SAFETY MARGIN (TESM)		15'	15'
TAXIWAY CENTERLINE TO PARALLEL TAXIWAY / TAXILANE CENTERLINE		267'	324'
TAXILANE CENTERLINE TO PARALLEL TAXILANE CENTERLINE		245'	298'
TAXIWAY LIGHTING		HITL	SAME
TAXIWAY MARKING		STANDARD	SAME
TAXIWAY SURFACE TYPE		ASPHALT/CONCRETE	SAME

RUNWAY SAFETY AREA DETERMINATION

RUNWAY ID	STANDARD RSA LENGTH BEYOND RUNWAY END	ACTUAL RSA		RSA DETERMINATION	DATE APPROVED
		LENGTH BEYOND RUNWAY END	VIOLATIONS TO RSA ALONG SIDE OF RUNWAY		
RUNWAY 4-22					
4	1,000'	1,000'	NONE	N/A	N/A
22	1,000'	1,000'	NONE		
PROPOSED RUNWAY 4R-22L					
4R	1,000'	1,000'	NONE	N/A	N/A
22L	1,000'	1,000'	NONE		

DECLARED DISTANCES

APPROACH END ID	TORA	TODA	ASDA	LDA	LDA		ASDA	DATE APPROVED
					APPROACH END RSA LENGTH	STOP END RSA LENGTH	RSA LENGTH	
RUNWAY 4-22								
4	11,001'	11,001'	11,001'	11,001'	1,000'	1,000'	1,000'	N/A
22	11,001'	11,001'	11,001'	11,001'	1,000'	1,000'	1,000'	
PROPOSED RUNWAY 4R-22L								
4R	7,000'	7,000'	7,000'	7,000'	1,000'	1,000'	1,000'	N/A
22L	7,000'	7,000'	7,000'	7,000'	1,000'	1,000'	1,000'	

MODIFICATION TO DESIGN STANDARDS

NO.	STANDARD MODIFIED	FAA STANDARDS	EXISTING CONDITION	PROPOSED ACTION	DATE APPROVED
1	AC 150/5340-30H	RUNWAY GUARD LIGHTS (RGL) SHOULD BE ON DEDICATED CIRCUITS	RUNWAY GUARD LIGHTS (RGL) ARE ON THE RUNWAY EDGE LIGHT CIRCUIT	ADD AN AIRFIELD ELECTRICAL IMPROVEMENT PROJECT INTO THE 5 YEAR ACIP TO MEET THE RGL STANDARD	09/11/2018 EXPIRES 9/11/2023
2	AC 150/5300-13 RUNWAY, SHOULDER, AND BLAST PAD WIDTH	ADG VI STANDARDS RUNWAY WIDTH: 200' RUNWAY SHOULDER WIDTH: 40' BLAST PAD WIDTH: 280'	ADG V STANDARDS RUNWAY WIDTH: 150' RUNWAY SHOULDER WIDTH: 35' BLAST PAD WIDTH: 220'	FAA ENGINEERING BRIEF NO. 74A APPROVES THE USE OF ADG V STANDARDS FOR B747-8 OPERATIONS	09/12/2012
3	AC 150/5300-13 TAXIWAY AND SHOULDER WIDTH	ADG VI STANDARDS TAXIWAY WIDTH: 82' TAXIWAY SHOULDER WIDTH: 40'	ADG V STANDARDS TAXIWAY WIDTH: 75' TAXIWAY SHOULDER WIDTH: 35'	FAA ENGINEERING BRIEF NO. 74A APPROVES THE USE OF ADG V STANDARDS FOR B747-8 OPERATIONS	09/12/2012

RUNWAY DATA TABLE

ITEM		RUNWAY 4-22	RUNWAY 4L-22R	RUNWAY 4R-22L
		EXISTING	PROPOSED	PROPOSED
APPROACH REFERENCE CODE (APRC)		D/VI/1600	SAME	D/IV/4000
DEPARTURE REFERENCE CODE (DPRC)		D/VI	SAME	D/V
CRITICAL AIRCRAFT		B 747-4F	B 747-8F	B 747-8F
PAVEMENT STRENGTH	PCN	65/R/B/W/T	SAME	
	SINGLE WHEEL	100,000	SAME	
	DOUBLE WHEEL	210,000	SAME	
	DOUBLE TANDEM	625,000	SAME	
	DUAL DOUBLE TANDEM	975,000	SAME	
SURFACE TYPE		ASPHALT/CONCRETE GROOVED	SAME	
EFFECTIVE RUNWAY GRADIENT		0.2%	SAME	1.1%
MAXIMUM GRADE CHANGE		2.6%	SAME	1.5%
RUNWAY BEARING		32.21° TRUE	SAME	32.21° TRUE
WIND COVERAGE (%)	ALL WEATHER	20.0 KN - 59.13% / 62.84%	SAME	20.0 KN - 59.13% / 62.84%
	IFR	20.0 KN - 58.32% / 64.16%	SAME	20.0 KN - 58.32% / 64.16%
RUNWAY LENGTH		11,001'	SAME	7,000'
RUNWAY WIDTH		150'	SAME	150'
RUNWAY SHOULDER WIDTH		35'	SAME	NONE
DISPLACED THRESHOLD		N/A	N/A	N/A
RUNWAY END COORDINATES	LATITUDE	4 - N34°52'58.40"	SAME	4R - N34°53'03.59"
	LONGITUDE	4 - W82°13'43.09"	SAME	4R - W82°12'38.12"
	LATITUDE	22 - N34°54'30.45"	SAME	22L - N34°54'02.16"
	LONGITUDE	22 - W82°12'32.69"	SAME	22L - W82°11'53.31"
RUNWAY LIGHTING		HIRL	SAME	HIRL
RUNWAY MARKING		PRECISION	SAME	PRECISION
CFR PART 77 APPROACH TYPE		PRECISION	SAME	PRECISION
CFR PART 77 APPROACH CATEGORY		50:1 - 40:1	SAME	50:1 - 40:1
VISIBILITY MINIMUMS		RWY 4 - 1/2 MILE RWY 22 - 1/2 MILE	SAME	RWY 4R - 1/2 MILE RWY 22L - 1/2 MILE
TYPE OF AERONAUTICAL SURVEY		VERTICALLY GUIDED	SAME	VERTICALLY GUIDED
RUNWAY DEPARTURE SURFACE		YES	SAME	YES
AIRPORT DESIGN APPROACH SURFACE		#5, #6	#5, #6	#5, #6
RUNWAY PROTECTION ZONE (RPZ)	INNER WIDTH	1,000'	SAME	1,000'
	OUTER WIDTH	1,750'	SAME	1,510'
	LENGTH	2,500'	SAME	1,700'
RUNWAY OBJECT FREE AREA (ROFA)	LENGTH BEYOND RUNWAY	1,000'	SAME	1,000'
	WIDTH	800'	SAME	800'
RUNWAY SAFETY AREA (RSA)	LENGTH BEYOND RUNWAY	1,000'	SAME	1,000'
	WIDTH	500'	SAME	500'
OBSTACLE FREE ZONE (OFZ)	LENGTH BEYOND RUNWAY	200'	SAME	200'
	WIDTH	400'	SAME	400'
VISUAL APPROACH AIDS		ALSF II, PAPI-4 / MALSR, PAPI-4	SAME / ALSF II, PAPI-4	ALSF II, PAPI-4 / ALSF II, PAPI-4
INSTRUMENT APPROACH AIDS		LOC, GS / LOC, GS	SAME	
MAXIMUM ELEVATION		963.6'	SAME	985.3'
RUNWAY END ELEVATIONS		940.8' / 963.6'	SAME	909.7' / 985.3'
DISPLACED THRESHOLD ELEVATION		N/A	N/A	N/A
TOUCH DOWN ZONE (TDZ) ELEVATION		946.7' / 963.6'	SAME	940.0' / 985.3'
LINE OF SIGHT VIOLATIONS		N/A	N/A	N/A

* LOWER VISIBILITY MINIMUM ACHIEVABLE WITH SPECIAL AIRCREW AND AIRCRAFT CERTIFICATION.

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

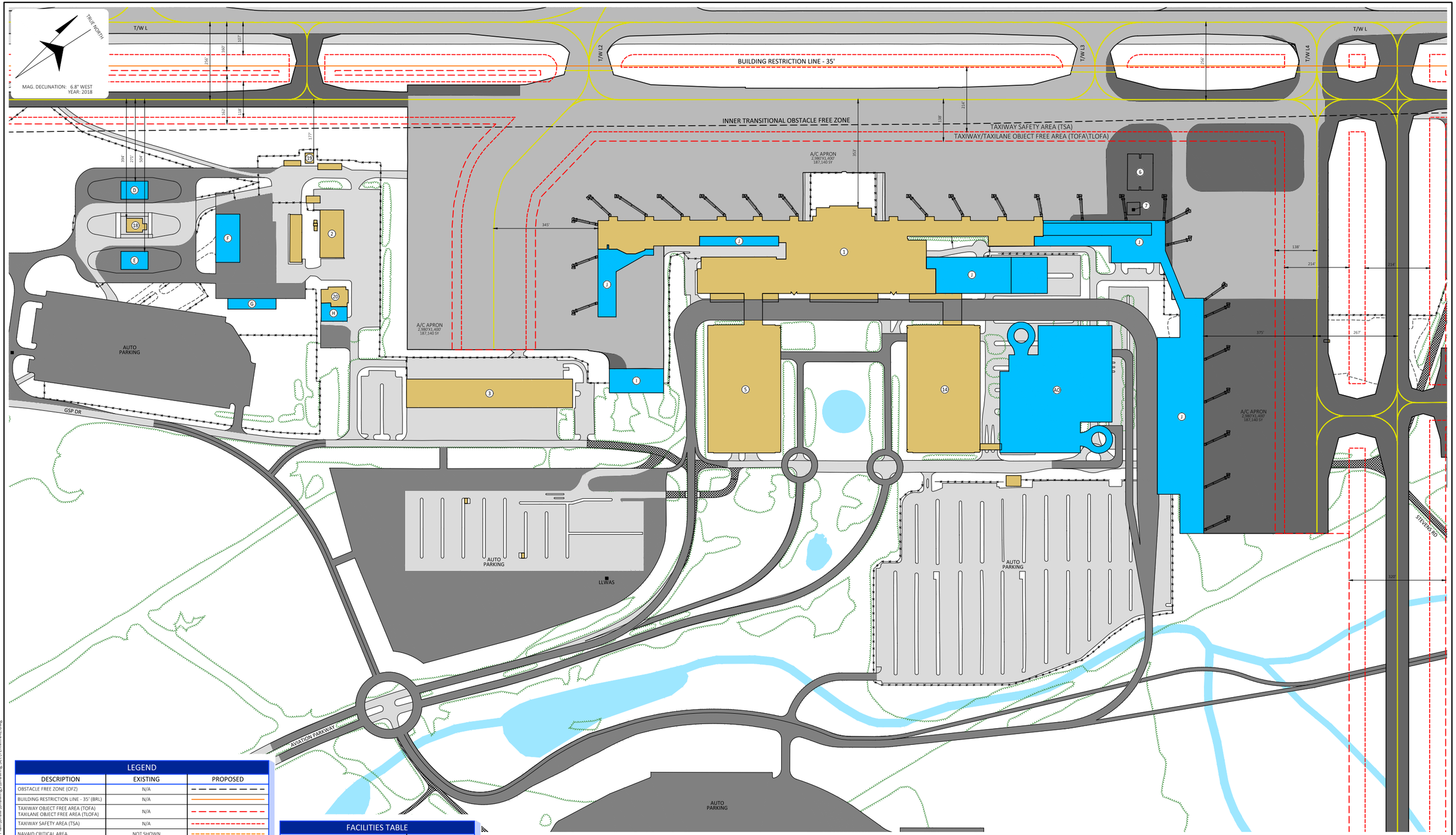
GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

AIRPORT DATA

SCALE: NONE	DESIGN: JM	SHEET: 3	
DRAWN: RGT	PROJECT: 18219.00		
CHECKED:	DATE: JANUARY 2020		

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\DATA.dwg

This page has been intentionally left blank.



LEGEND

DESCRIPTION	EXISTING	PROPOSED
OBSTACLE FREE ZONE (OFZ)	N/A	
BUILDING RESTRICTION LINE - 35' (BRL)	N/A	
TAXIWAY OBJECT FREE AREA (TOFA) TAXILANE OBJECT FREE AREA (TLOFA)	N/A	
TAXIWAY SAFETY AREA (TSA)	N/A	
NAVAID CRITICAL AREA	NOT SHOWN	
AIRPORT PAVEMENT		
GROUND VEHICLE PAVEMENT		
ON-AIRPORT BUILDINGS		
OFF-AIRPORT BUILDINGS		SAME
TO BE REMOVED	N/A	
AIRPORT PROPERTY		
COUNTY BOUNDARY		SAME
FENCE		SAME
TREE LINE		SAME
WATER		SAME

FACILITIES TABLE

EXISTING			PROPOSED	
ID	FACILITY NAME	TOP ELEV.	ID	FACILITY NAME
1	AIR CARRIER CONCOURSE	980.7'	D	FUEL FARM
2	EQUIPMENT BUILDING	957.8'	E	FUEL FARM
3	AIR CARGO	955.3'	F	EQUIPMENT BUILDING
5	PARKING GARAGE A	953.6'	G	EQUIPMENT BUILDING
6	ARFF & ELECTRICAL VAULT	953.1'	H	OFFICE BUILDING
7	ATCT AND BEACON	1,045.1'	I	AIRLINE GSE
14	PARKING GARAGE B	953.6'	J	TERMINAL EXPANSION
18	FUEL FARM	947.2'	AO	PARKING GARAGE C
19	DEICE & UNLEADED/DIESEL FUEL FARM	953.6'		
20	MAINTENANCE OFFICE	948.7'		

SCALE

0 150 300 450 600

FEET

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.

REV	DATE	DESCRIPTION	BY	SPONSOR

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

GREER, SOUTH CAROLINA

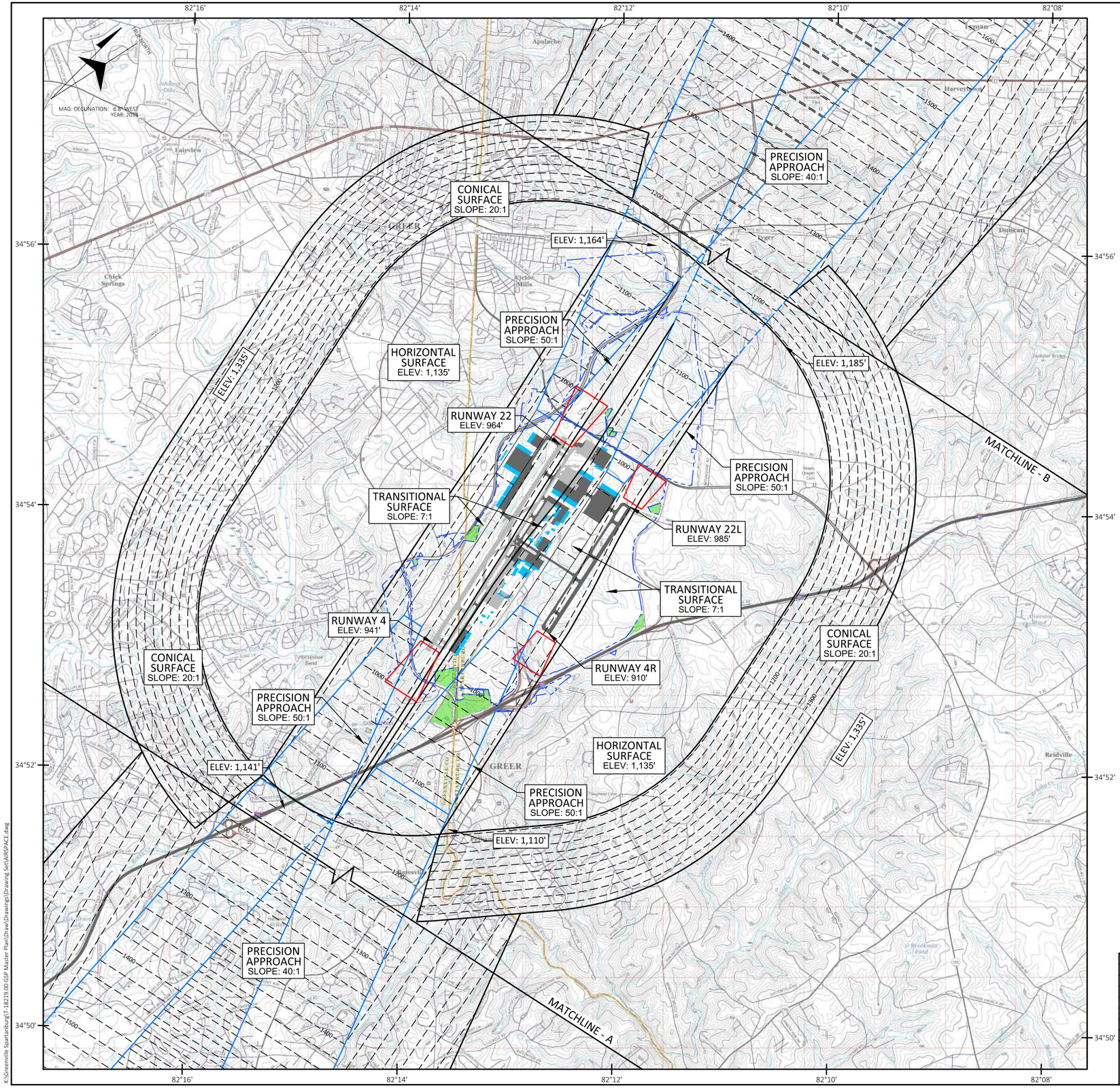
TERMINAL AREA PLAN

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

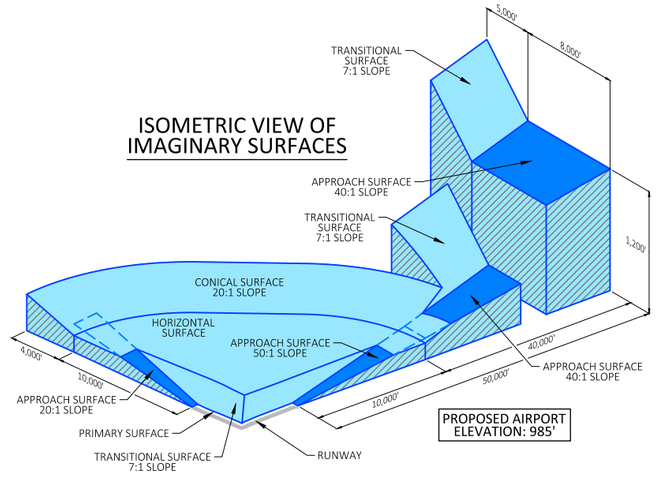
SCALE:	1" = 150'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020
SHEET:	4		

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\TERMINAL.dwg

This page has been intentionally left blank.



ISOMETRIC VIEW OF IMAGINARY SURFACES



EXISTING AIRPORT PROPERTY

RUNWAY PROTECTION ZONE

PROPOSED AIRPORT PROPERTY

NO IDENTIFIED OBSTRUCTIONS OUTSIDE OF INNER PORTION OF APPROACH SURFACE

USGS QUADRANGLES	
TAYLORS, SOUTH CAROLINA 2017	GREER, SOUTH CAROLINA 2017
MAULDIN, SOUTH CAROLINA 2017	PELHAM, SOUTH CAROLINA 2017

SCALE

0 2400 4800 7200 9600

FEET

NOTES:

- FOR INNER APPROACH OBSTRUCTIONS PLEASE REFER TO SHEET 7 THRU 10.
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- REFER TO GREENVILLE-SPARTANBURG AIRPORT ENVIRONS AREA ZONING ORDINANCE, 1999.

REV	DATE	DESCRIPTION	BY	SPONSOR

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

GREER, SOUTH CAROLINA

AIRPORT AIRSPACE PLAN

McFarland Johnson

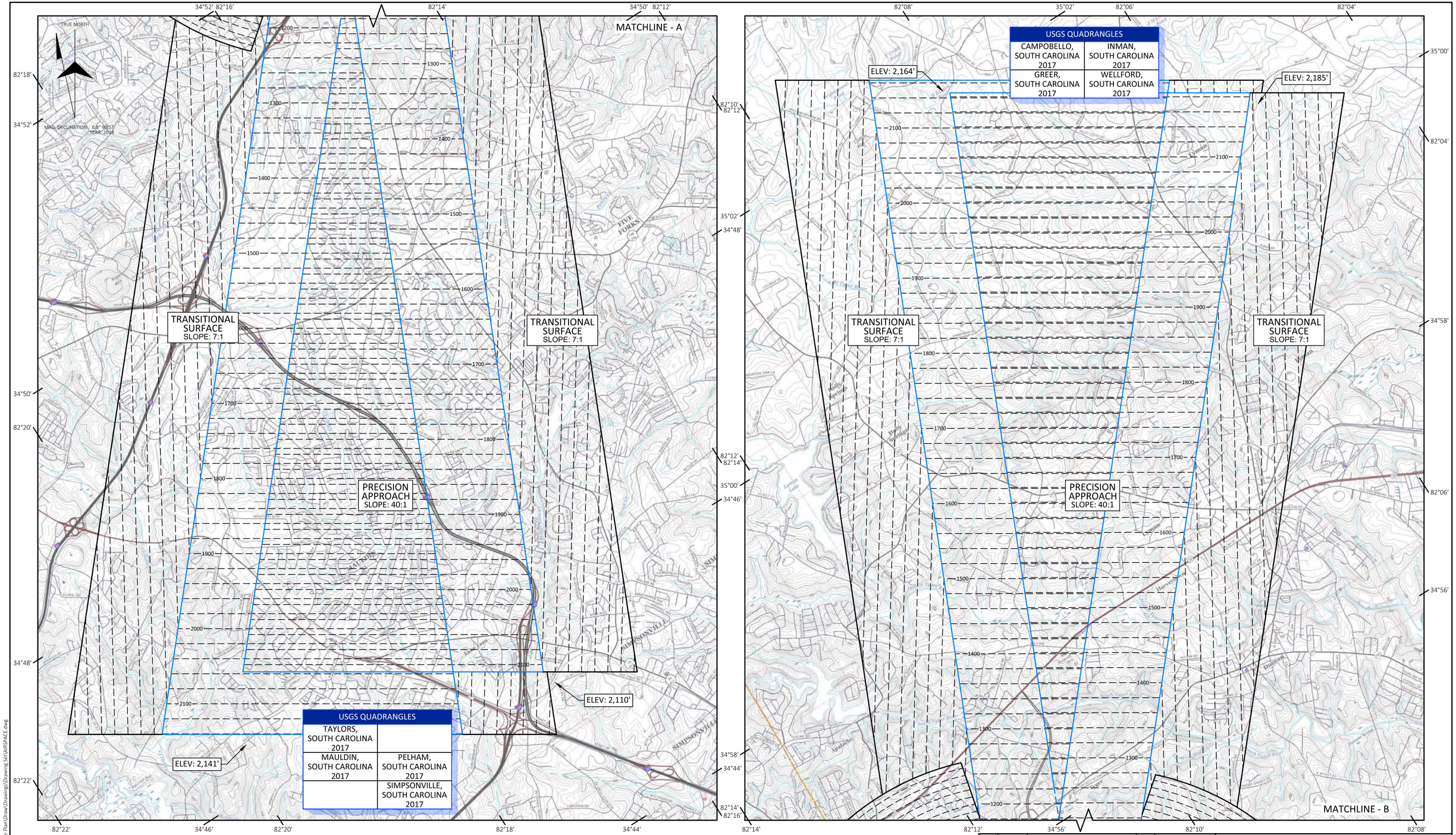
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

SCALE:	1" = 2,400'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 5

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\AIRSPACE.dwg

This page has been intentionally left blank.



NO IDENTIFIED OBSTRUCTIONS OUTSIDE OF INNER PORTION OF APPROACH SURFACE

SCALE

0 2400 4800 7200 9600

FEET

NOTES:

- FOR INNER APPROACH OBSTRUCTIONS PLEASE REFER TO SHEET 7 THRU 10.
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

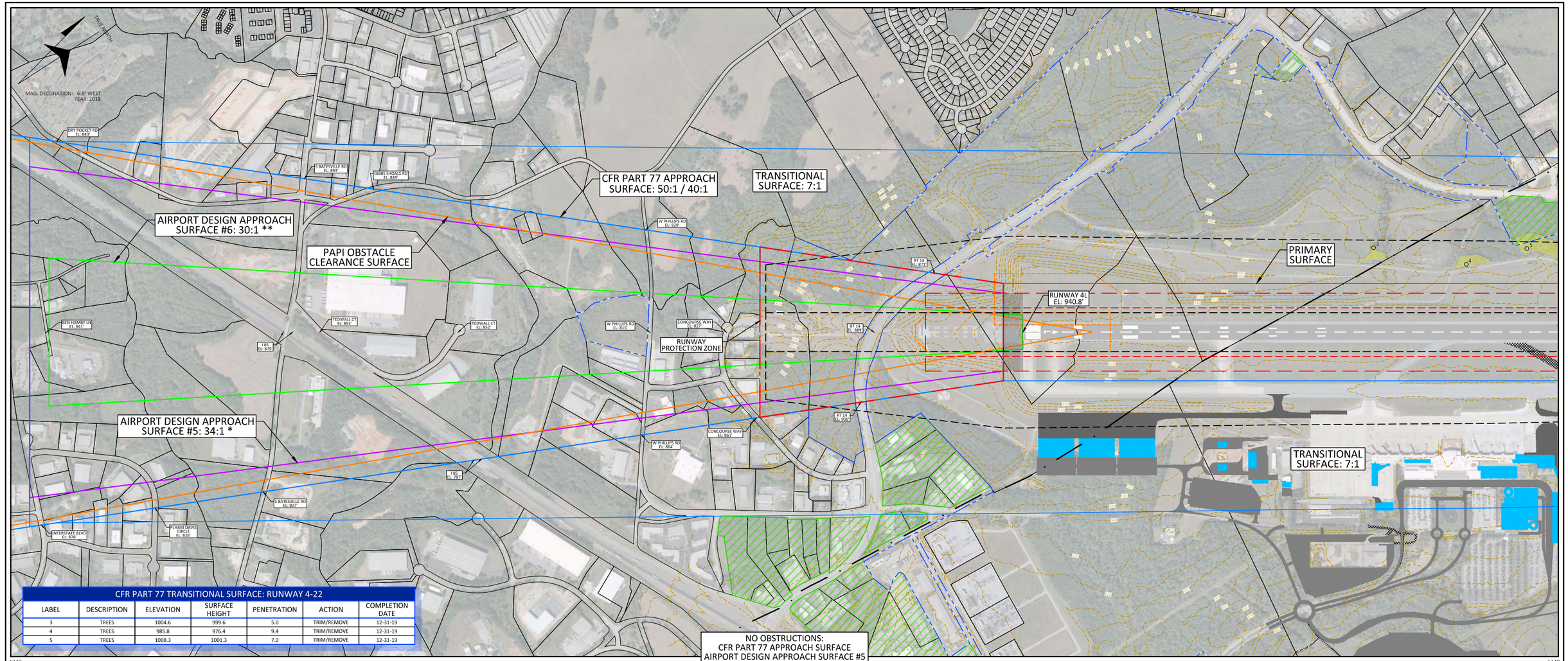
GREER, SOUTH CAROLINA

OUTER AIRPORT AIRSPACE PLAN

SCALE: 1" = 2,400'	DESIGN: JM	SHEET: 6	
DRAWN: RGT	PROJECT: 18219.00		
CHECKED:	DATE: JANUARY 2020		

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\AIRSPACE.dwg

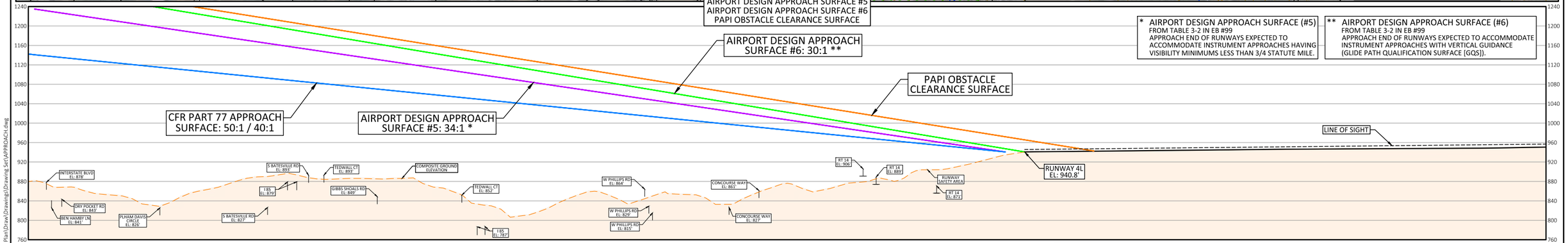
This page has been intentionally left blank.



CFR PART 77 TRANSITIONAL SURFACE: RUNWAY 4-22

LABEL	DESCRIPTION	ELEVATION	SURFACE HEIGHT	PENETRATION	ACTION	COMPLETION DATE
3	TREES	1004.6	999.6	5.0	TRIM/REMOVE	12-31-19
4	TREES	985.8	976.4	9.4	TRIM/REMOVE	12-31-19
5	TREES	1008.3	1001.3	7.0	TRIM/REMOVE	12-31-19

NO OBSTRUCTIONS:
CFR PART 77 APPROACH SURFACE
AIRPORT DESIGN APPROACH SURFACE #5
AIRPORT DESIGN APPROACH SURFACE #6
PAPI OBSTACLE CLEARANCE SURFACE



* AIRPORT DESIGN APPROACH SURFACE (#5)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES HAVING VISIBILITY MINIMUMS LESS THAN 3/4 STATUTE MILE.

** AIRPORT DESIGN APPROACH SURFACE (#6)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES WITH VERTICAL GUIDANCE (GLIDE PATH QUALIFICATION SURFACE [GQS]).

SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL
200
100
0
500
FEET
1000

LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
RUNWAY SAFETY AREA (RSA)		OBSTACLE FREE ZONE (OFZ)		CFR PART 77 OBSTRUCTIONS	000
RUNWAY OBJECT FREE AREA (ROFA)		PRECISION OBSTACLE FREE ZONE (POFZ)		CFR PART 77 VEGETATION OBSTRUCTIONS	
RUNWAY PROTECTION ZONE (RPZ)		PROPOSED NAVAID CRITICAL AREA		COUNTY BOUNDARY	
PROPOSED AIRPORT PAVEMENT		EXISTING AIRPORT PROPERTY		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		PROPOSED AIRPORT PROPERTY		GROUND ELEVATION CONTOURS (10')	900
TO BE REMOVED		PROPOSED AIRPORT BUILDINGS			

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

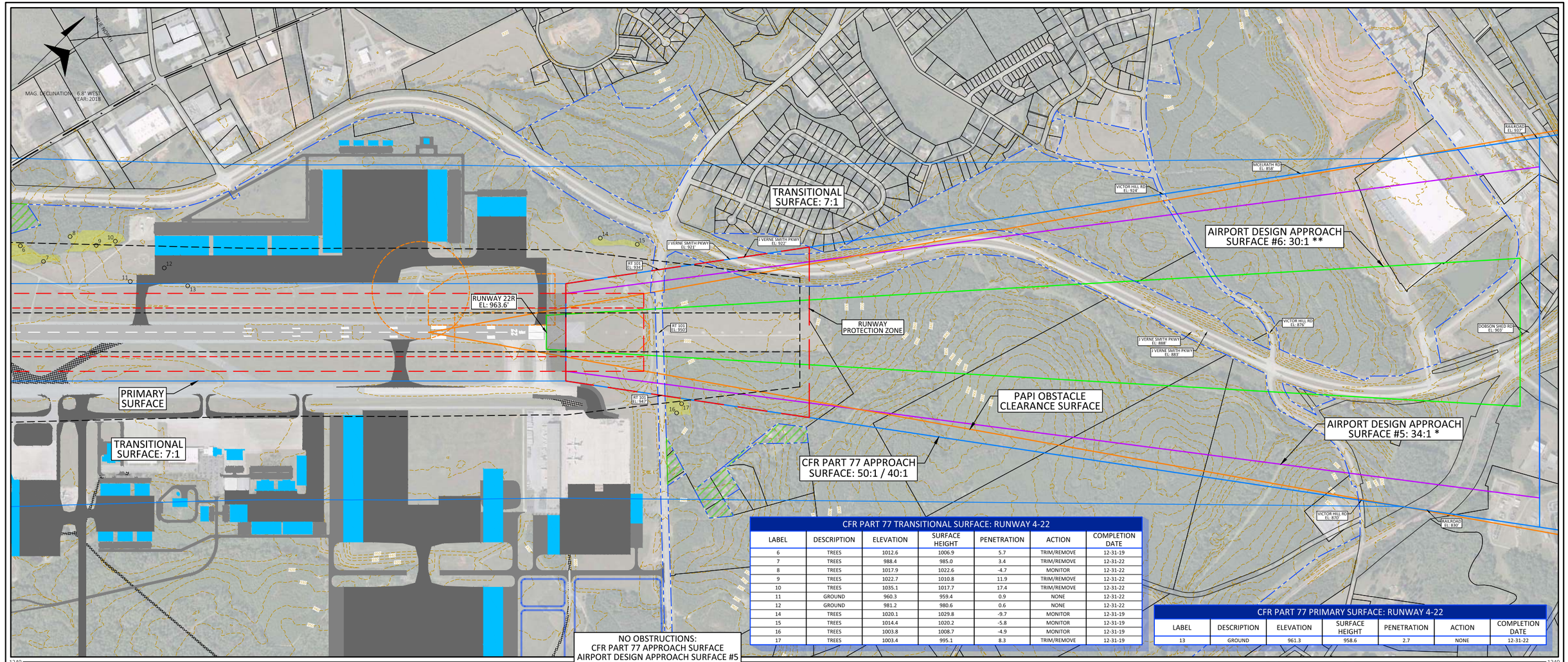
INNER APPROACH PLAN
RUNWAY 4L

SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 7

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\[Drawing Set\APPROACH.dwg

This page has been intentionally left blank.


TRUE NORTH
MAG. DECLINATION: 6.8° WEST
YEAR: 2018
RUNWAY 22R
EL: 963.6'
PRIMARY SURFACE
TRANSITIONAL SURFACE: 7:1
TRANSITIONAL SURFACE: 7:1
RUNWAY PROTECTION ZONE
AIRPORT DESIGN APPROACH SURFACE #6: 30:1 **
PAPI OBSTACLE CLEARANCE SURFACE
AIRPORT DESIGN APPROACH SURFACE #5: 34:1 *
CFR PART 77 APPROACH SURFACE: 50:1 / 40:1
J VERNE SMITH PKWY EL: 921
J VERNE SMITH PKWY EL: 922
J VERNE SMITH PKWY EL: 888'
J VERNE SMITH PKWY EL: 883'
RT 101 EL: 934
RT 101 EL: 950
RT 101 EL: 947
VICTOR HILL RD EL: 924'
VICTOR HILL RD EL: 870'
MCELRATH RD EL: 858'
DOBSON SHED RD EL: 903'
RAILROAD EL: 937'
RAILROAD EL: 830'

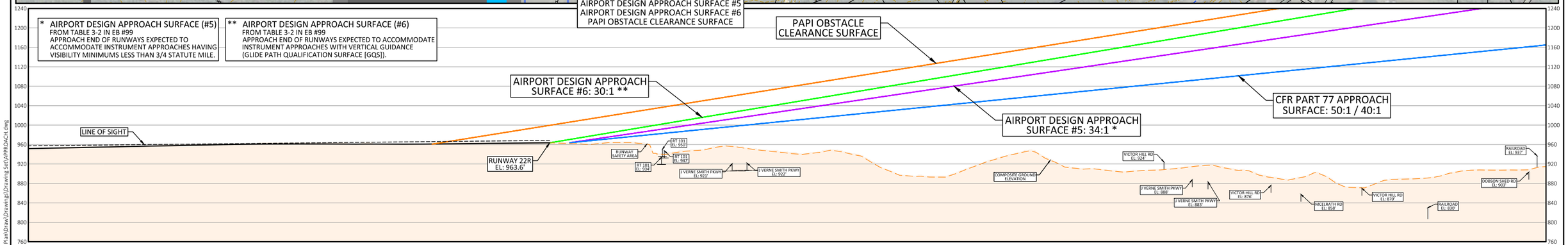
CFR PART 77 TRANSITIONAL SURFACE: RUNWAY 4-22						
LABEL	DESCRIPTION	ELEVATION	SURFACE HEIGHT	PENETRATION	ACTION	COMPLETION DATE
6	TREES	1012.6	1006.9	5.7	TRIM/REMOVE	12-31-19
7	TREES	988.4	985.0	3.4	TRIM/REMOVE	12-31-22
8	TREES	1017.9	1022.6	-4.7	MONITOR	12-31-22
9	TREES	1022.7	1010.8	11.9	TRIM/REMOVE	12-31-22
10	TREES	1035.1	1017.7	17.4	TRIM/REMOVE	12-31-22
11	GROUND	960.3	959.4	0.9	NONE	12-31-22
12	GROUND	981.2	980.6	0.6	NONE	12-31-22
14	TREES	1020.1	1029.8	-9.7	MONITOR	12-31-19
15	TREES	1014.4	1020.2	-5.8	MONITOR	12-31-19
16	TREES	1003.8	1008.7	-4.9	MONITOR	12-31-19
17	TREES	1003.4	995.1	8.3	TRIM/REMOVE	12-31-19

CFR PART 77 PRIMARY SURFACE: RUNWAY 4-22						
LABEL	DESCRIPTION	ELEVATION	SURFACE HEIGHT	PENETRATION	ACTION	COMPLETION DATE
13	GROUND	961.3	958.6	2.7	NONE	12-31-22

NO OBSTRUCTIONS:
CFR PART 77 APPROACH SURFACE
AIRPORT DESIGN APPROACH SURFACE #5
AIRPORT DESIGN APPROACH SURFACE #6
PAPI OBSTACLE CLEARANCE SURFACE

* AIRPORT DESIGN APPROACH SURFACE (#5)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES HAVING VISIBILITY MINIMUMS LESS THAN 3/4 STATUTE MILE.

** AIRPORT DESIGN APPROACH SURFACE (#6)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES WITH VERTICAL GUIDANCE (GLIDE PATH QUALIFICATION SURFACE [GQS]).



SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL

0 500 1000 FEET
100 200

LEGEND					
DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
RUNWAY SAFETY AREA (RSA)		OBSTACLE FREE ZONE (OFZ)		CFR PART 77 OBSTRUCTIONS	000
RUNWAY OBJECT FREE AREA (ROFA)		PRECISION OBSTACLE FREE ZONE (POFZ)		CFR PART 77 VEGETATION OBSTRUCTIONS	
RUNWAY PROTECTION ZONE (RPZ)		PROPOSED NAVAID CRITICAL AREA		COUNTY BOUNDARY	
PROPOSED AIRPORT PAVEMENT		EXISTING AIRPORT PROPERTY		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		PROPOSED AIRPORT PROPERTY		GROUND ELEVATION CONTOURS (10')	900
TO BE REMOVED		PROPOSED AIRPORT BUILDINGS			

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

INNER APPROACH PLAN
RUNWAY 22R

SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 8

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\APPROACH.dwg

This page has been intentionally left blank.

TRUE NORTH

MAG. DECLINATION: 6.8° WEST
YEAR: 2018

AIRPORT DESIGN APPROACH SURFACE #6: 30:1 **

AIRPORT DESIGN APPROACH SURFACE #5: 34:1 *

TRANSITIONAL SURFACE: 7:1

RUNWAY PROTECTION ZONE

RUNWAY 4R EL: 909.7

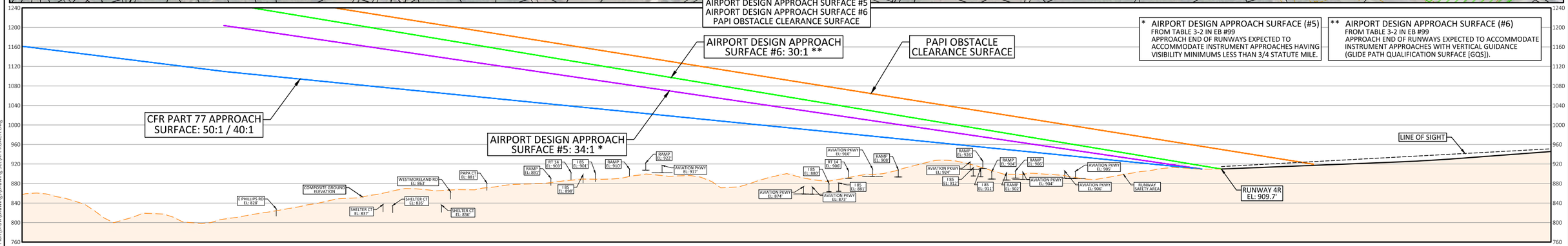
PRIMARY SURFACE

TRANSITIONAL SURFACE: 7:1

PAPI OBSTACLE CLEARANCE SURFACE

CFR PART 77 APPROACH SURFACE: 50:1 / 40:1

NO OBSTRUCTIONS:
CFR PART 77 APPROACH SURFACE
AIRPORT DESIGN APPROACH SURFACE #5
AIRPORT DESIGN APPROACH SURFACE #6
PAPI OBSTACLE CLEARANCE SURFACE


AIRPORT DESIGN APPROACH SURFACE #6: 30:1 **
PAPI OBSTACLE CLEARANCE SURFACE
CFR PART 77 APPROACH SURFACE: 50:1 / 40:1
AIRPORT DESIGN APPROACH SURFACE #5: 34:1 *
LINE OF SIGHT
RUNWAY 4R EL: 909.7'
E PHILLIPS RD EL: 828'
COMPOSITE GROUND ELEVATION
SHELTER CT EL: 837'
SHELTER CT EL: 835'
SHELTER CT EL: 836'
WESTMORELAND RD EL: 863'
PAPA CT EL: 881'
RT 14 EL: 903'
I 85 EL: 898'
I 85 EL: 901'
RAMP EL: 891'
RAMP EL: 910'
RAMP EL: 922'
AVIATION PKWY EL: 917'
AVIATION PKWY EL: 874'
AVIATION PKWY EL: 873'
I 85 EL: 880'
I 85 EL: 881'
RT 14 EL: 906'
AVIATION PKWY EL: 910'
RAMP EL: 908'
AVIATION PKWY EL: 924'
I 85 EL: 912'
RAMP EL: 926'
I 85 EL: 911'
RAMP EL: 904'
RAMP EL: 902'
RAMP EL: 906'
AVIATION PKWY EL: 904'
AVIATION PKWY EL: 905'
AVIATION PKWY EL: 908'
RUNWAY SAFETY AREA

* AIRPORT DESIGN APPROACH SURFACE (#5)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES HAVING VISIBILITY MINIMUMS LESS THAN 3/4 STATUTE MILE.

** AIRPORT DESIGN APPROACH SURFACE (#6)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES WITH VERTICAL GUIDANCE (GLIDE PATH QUALIFICATION SURFACE [GQS]).

SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL
0 500 1000 FEET
200 100

LEGEND					
DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
RUNWAY SAFETY AREA (RSA)		OBSTACLE FREE ZONE (OFZ)		CFR PART 77 OBSTRUCTIONS	000
RUNWAY OBJECT FREE AREA (ROFA)		PRECISION OBSTACLE FREE ZONE (POFZ)		CFR PART 77 VEGETATION OBSTRUCTIONS	
RUNWAY PROTECTION ZONE (RPZ)		PROPOSED NAVAID CRITICAL AREA		COUNTY BOUNDARY	
PROPOSED AIRPORT PAVEMENT		EXISTING AIRPORT PROPERTY		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		PROPOSED AIRPORT PROPERTY		GROUND ELEVATION CONTOURS (10')	900
TO BE REMOVED		PROPOSED AIRPORT BUILDINGS			

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

INNER APPROACH PLAN RUNWAY 4R

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020
SHEET:	9		

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawing\Drawing Set\APPROACH.dwg

This page has been intentionally left blank.

PRIMARY SURFACE

TRANSITIONAL SURFACE: 7:1

RUNWAY PROTECTION ZONE

RUNWAY 22L EL: 985.3'

TRANSITIONAL SURFACE: 7:1

PAPI OBSTACLE CLEARANCE SURFACE

AIRPORT DESIGN APPROACH SURFACE #6: 30:1 **

CFR PART 77 APPROACH SURFACE: 50:1 / 40:1

AIRPORT DESIGN APPROACH SURFACE #5: 34:1 *

MAG. DECLINATION: 6.8° WEST
YEAR: 2018

RT 101 EL: 941'
RT 101 EL: 944'
RT 101 EL: 883'
HENDRIX RD EL: 950'
HENDRIX RD EL: 949'
RAILROAD EL: 976'
RAILROAD EL: 915'
RAILROAD EL: 916'
BROOKSHIRE RD EL: 961'
GILLIAM RD EL: 954'
LAMIRA AVE EL: 918'
VICTOR HILL RD EL: 921'
VICTOR HILL RD EL: 885'
CHAPEL RD EL: 875'
GENOBLE RD EL: 924'
GILLIAM RD EL: 925'

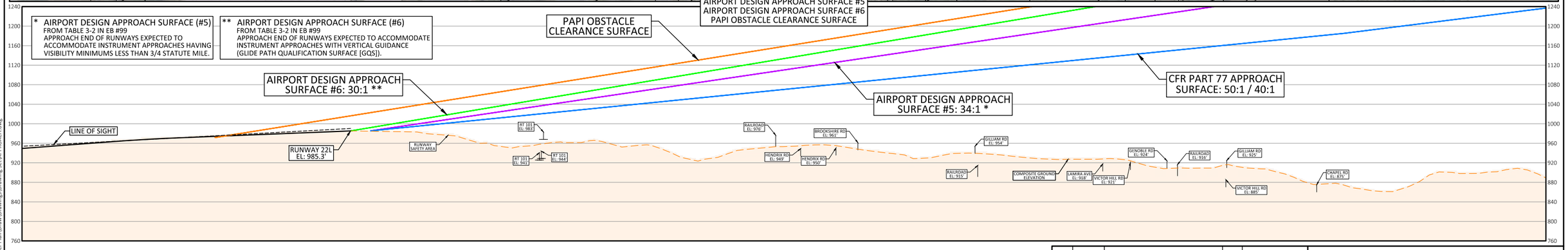
CFR PART 77 TRANSITIONAL SURFACE: RUNWAY 4-22

LABEL	DESCRIPTION	ELEVATION	SURFACE HEIGHT	PENETRATION	ACTION	COMPLETION DATE
18	TREES	1074.6	1072.5	2.1	TRIM/REMOVE	12-31-22
19	TREES	1073.0	998.7	74.3	TRIM/REMOVE	12-31-22

NO OBSTRUCTIONS:
CFR PART 77 APPROACH SURFACE
AIRPORT DESIGN APPROACH SURFACE #5
AIRPORT DESIGN APPROACH SURFACE #6
PAPI OBSTACLE CLEARANCE SURFACE

* AIRPORT DESIGN APPROACH SURFACE (#5)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES HAVING VISIBILITY MINIMUMS LESS THAN 3/4 STATUTE MILE.

** AIRPORT DESIGN APPROACH SURFACE (#6)
FROM TABLE 3-2 IN EB #99
APPROACH END OF RUNWAYS EXPECTED TO ACCOMMODATE INSTRUMENT APPROACHES WITH VERTICAL GUIDANCE (GLIDE PATH QUALIFICATION SURFACE [GQS]).



SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL

200
100
0
500
1000
FEET

LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
RUNWAY SAFETY AREA (RSA)		OBSTACLE FREE ZONE (OFZ)		CFR PART 77 OBSTRUCTIONS	000
RUNWAY OBJECT FREE AREA (ROFA)		PRECISION OBSTACLE FREE ZONE (POFZ)		CFR PART 77 VEGETATION OBSTRUCTIONS	
RUNWAY PROTECTION ZONE (RPZ)		PROPOSED NAVAID CRITICAL AREA		COUNTY BOUNDARY	
PROPOSED AIRPORT PAVEMENT		EXISTING AIRPORT PROPERTY		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		PROPOSED AIRPORT PROPERTY		GROUND ELEVATION CONTOURS (10')	900
TO BE REMOVED		PROPOSED AIRPORT BUILDINGS			

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

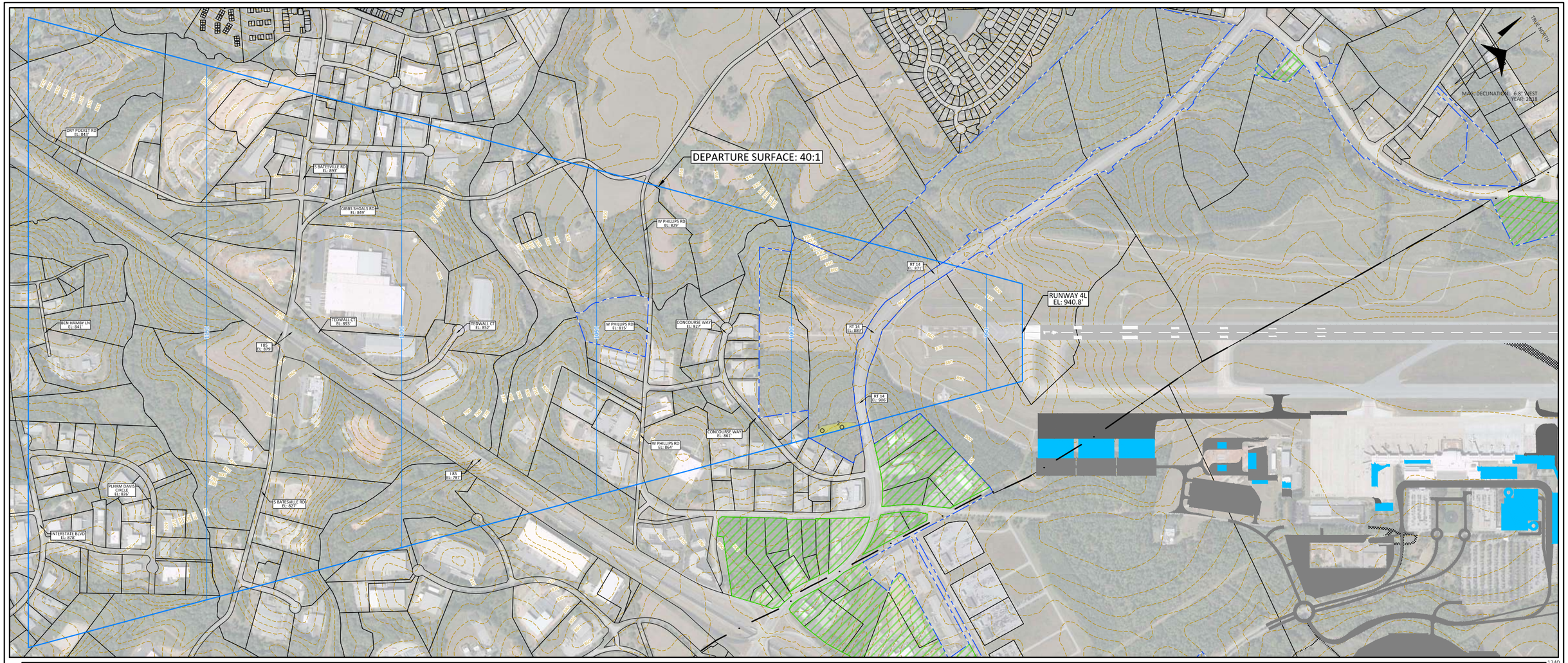
INNER APPROACH PLAN
RUNWAY 22L

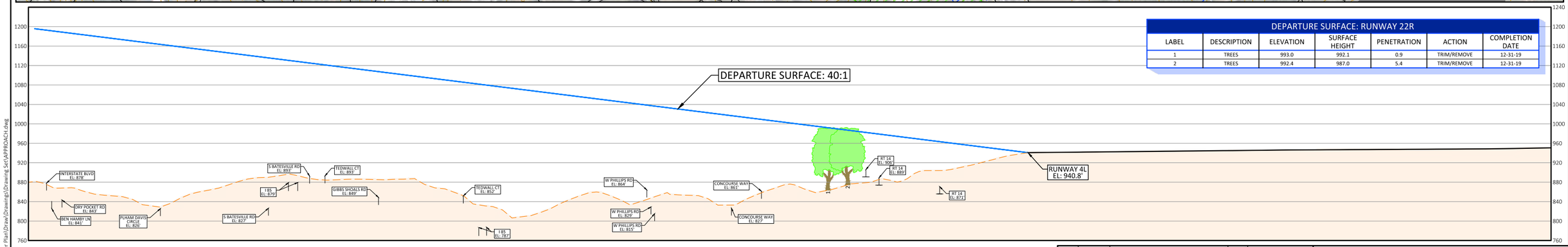
SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 10

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\APPROACH.dwg

This page has been intentionally left blank.





DEPARTURE SURFACE: RUNWAY 22R						
LABEL	DESCRIPTION	ELEVATION	SURFACE HEIGHT	PENETRATION	ACTION	COMPLETION DATE
1	TREES	993.0	992.1	0.9	TRIM/REMOVE	12-31-19
2	TREES	992.4	987.0	5.4	TRIM/REMOVE	12-31-19

SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL
0 500 1000 FEET
200 100

LEGEND					
DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
EXISTING AIRPORT PROPERTY		COUNTY BOUNDARY		OBSTRUCTIONS	000
PROPOSED AIRPORT PROPERTY		PROPOSED AIRPORT BUILDINGS		VEGETATION OBSTRUCTIONS	
PROPOSED AIRPORT PAVEMENT		TO BE REMOVED		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		GROUND ELEVATION CONTOURS (50')	900		

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

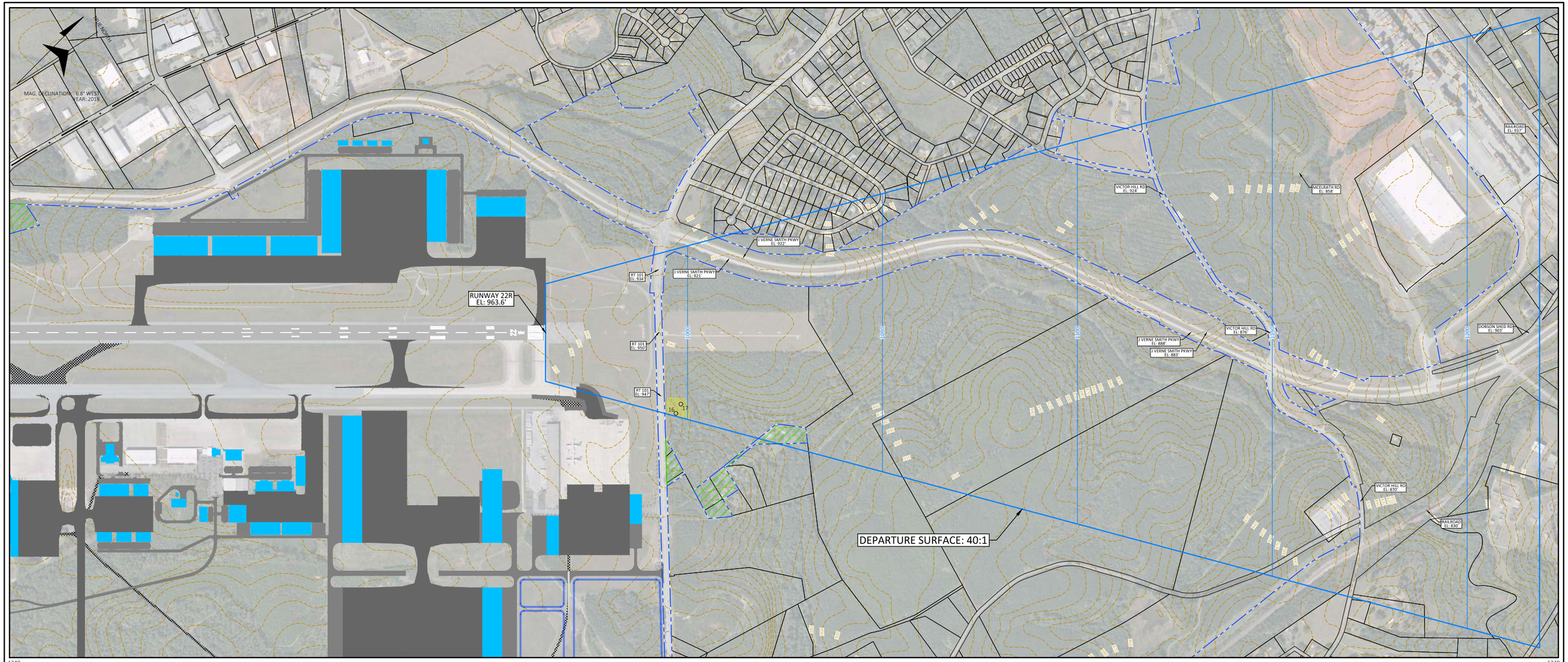
GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

DEPARTURE SURFACE PLAN RUNWAY 22R

SCALE:	1" = 500'	DESIGN:	JM	SHEET:
DRAWN:	RGT	PROJECT:	18219.00	11
CHECKED:		DATE:	JANUARY 2020	

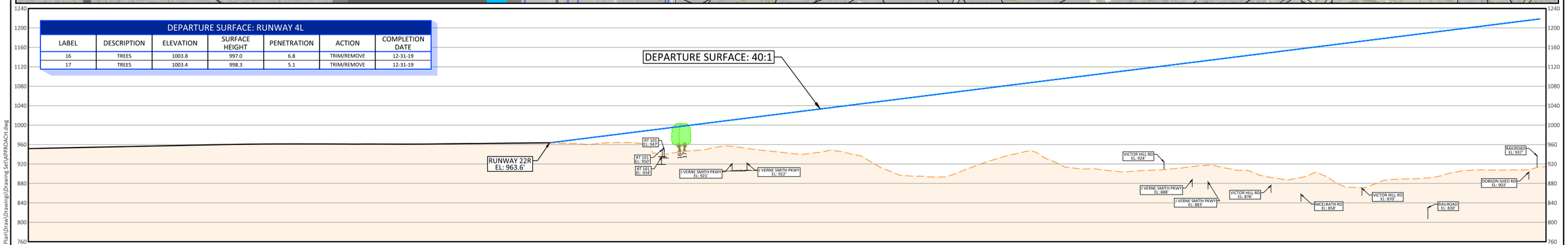
K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawing\Drawing Set\APPROACH.dwg

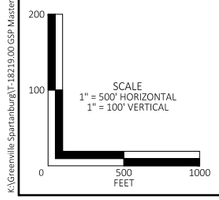
This page has been intentionally left blank.



DEPARTURE SURFACE: RUNWAY 4L

LABEL	DESCRIPTION	ELEVATION	SURFACE HEIGHT	PENETRATION	ACTION	COMPLETION DATE
16	TREES	1003.8	997.0	6.8	TRIM/REMOVE	12-31-19
17	TREES	1003.4	998.3	5.1	TRIM/REMOVE	12-31-19





LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
EXISTING AIRPORT PROPERTY		COUNTY BOUNDARY		OBSTRUCTIONS	000
PROPOSED AIRPORT PROPERTY		PROPOSED AIRPORT BUILDINGS		VEGETATION OBSTRUCTIONS	
PROPOSED AIRPORT PAVEMENT		TO BE REMOVED		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		GROUND ELEVATION CONTOURS (50')	900		

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

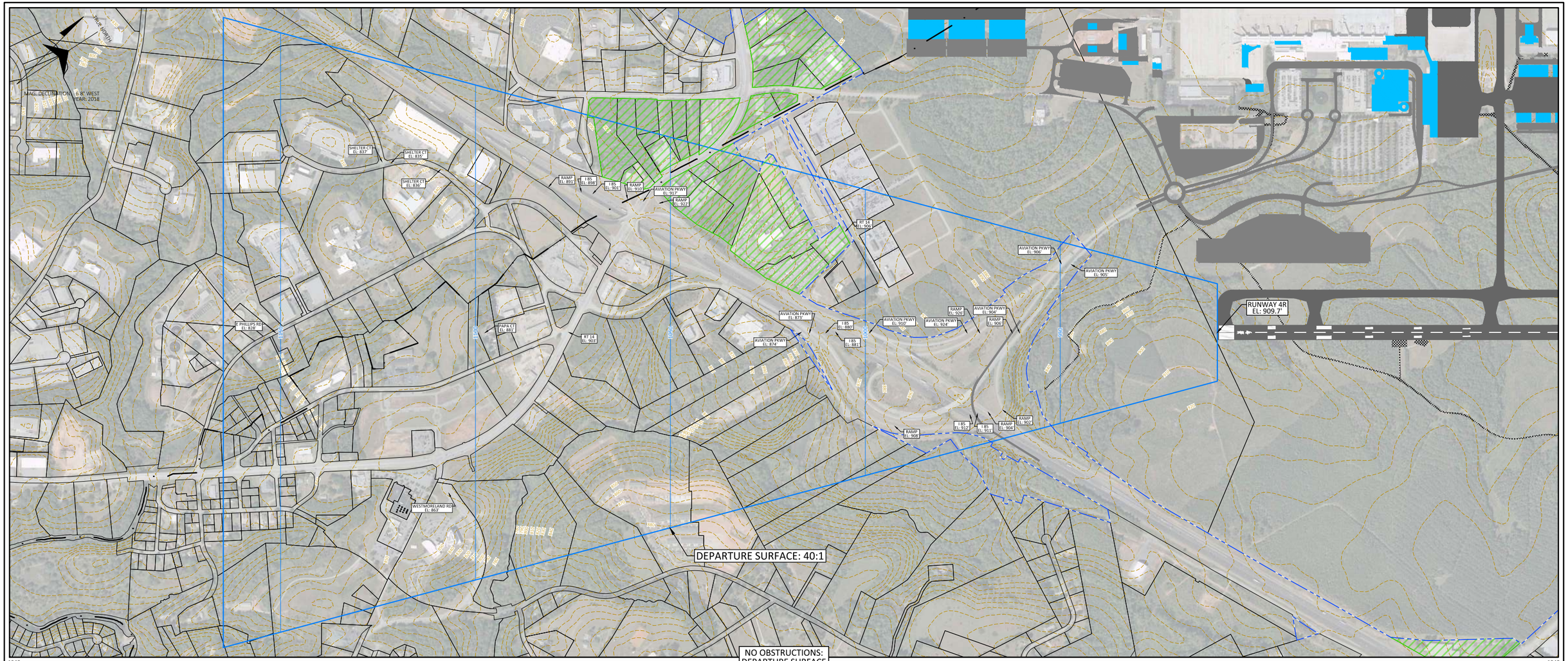
DEPARTURE SURFACE PLAN RUNWAY 4L

SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

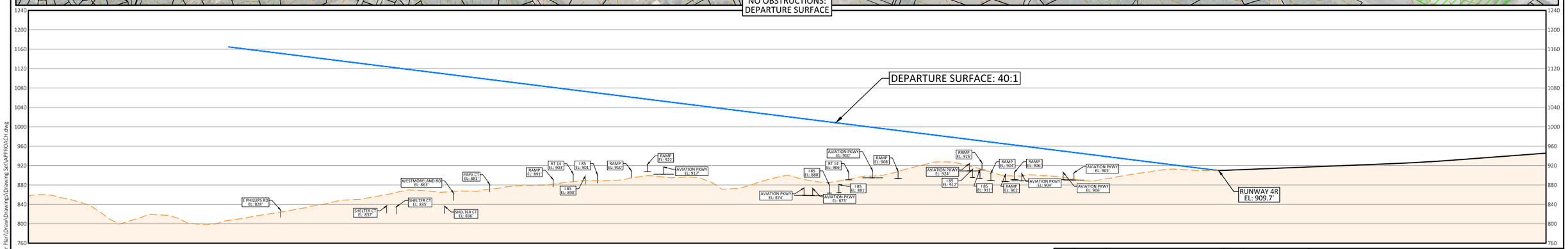
SHEET: 12

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\APPROACH.dwg

This page has been intentionally left blank.



NO OBSTRUCTIONS: DEPARTURE SURFACE



SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL
200
100
0
500
1000
FEET

LEGEND					
DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
EXISTING AIRPORT PROPERTY		COUNTY BOUNDARY		OBSTRUCTIONS	000
PROPOSED AIRPORT PROPERTY		PROPOSED AIRPORT BUILDINGS		VEGETATION OBSTRUCTIONS	
PROPOSED AIRPORT PAVEMENT		TO BE REMOVED		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		GROUND ELEVATION CONTOURS (50')	900		

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

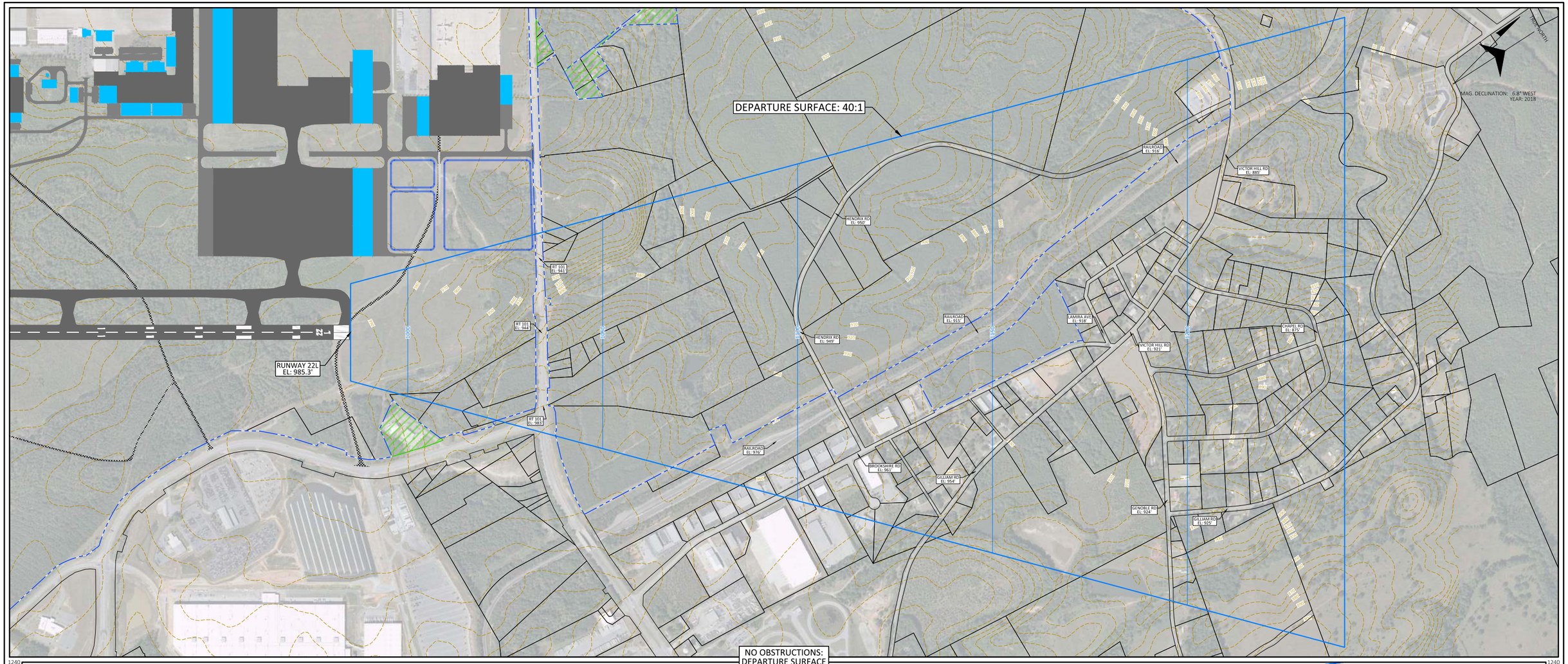
DEPARTURE SURFACE PLAN RUNWAY 22L

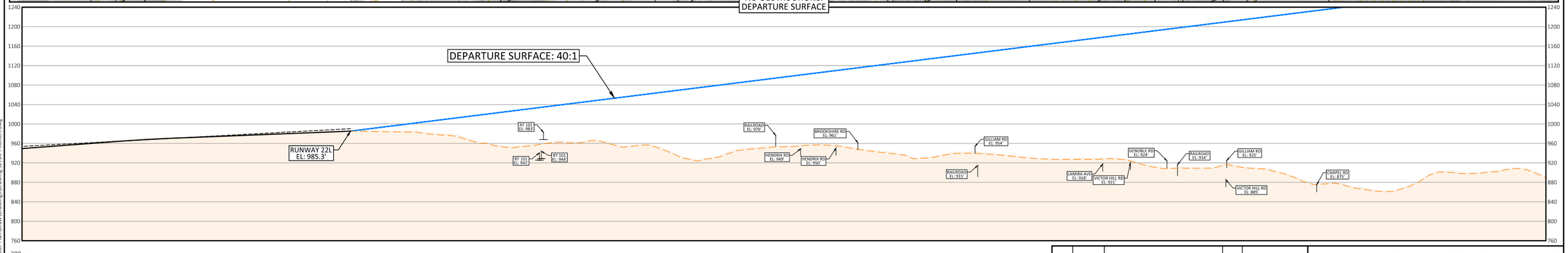
SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 13

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\APPROACH.dwg

This page has been intentionally left blank.





SCALE
1" = 500' HORIZONTAL
1" = 100' VERTICAL

200
100
0
500
1000
FEET

LEGEND					
DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
EXISTING AIRPORT PROPERTY		COUNTY BOUNDARY		OBSTRUCTIONS	000
PROPOSED AIRPORT PROPERTY		PROPOSED AIRPORT BUILDINGS		VEGETATION OBSTRUCTIONS	
PROPOSED AIRPORT PAVEMENT		TO BE REMOVED		PARCEL BOUNDARY	
PROPOSED GROUND VEHICLE PAVEMENT		GROUND ELEVATION CONTOURS (50')	900		

NOTES:
- ALL POSITIONAL DATA REFERENCES NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN VERTICAL DATUM 1988 (NGVD88).
- ALL ELEVATIONS SHOWN ARE AMSL.
- AERIAL MAPPING BY WOOLPERT, 2017.
- ROAD ELEVATIONS AS INDICATED INCLUDE CONSIDERATION OF VEHICLES PER CFR PART 77. (15' FOR ROAD, 17' FOR INTERSTATE, 23' FOR RAILROAD)
- TREES WITHIN 10' OF SURFACE IDENTIFIED AS OBSTRUCTIONS.
- COMPOSITE GROUND ELEVATION PROFILE LIMITED TO CFR PART 77 APPROACH SURFACE.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

DEPARTURE SURFACE PLAN
RUNWAY 4R

SCALE:	1" = 500'	DESIGN:	JM
DRAWN:	RGT	PROJECT:	18219.00
CHECKED:		DATE:	JANUARY 2020

SHEET: 14

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\APPROACH1.dwg

Sheet 14: Departure Surface Plan Runway 4R

LEGEND		
DESCRIPTION	EXISTING	PROPOSED
AIRPORT LAND USE		
AVIATION		SAME
AVIATION SUPPORT		SAME
AEROSPACE		SAME
COMMERCIAL (HOSPITALITY / OFFICE)		SAME
COMMERCIAL (RETAIL / SERVICE)		SAME
INDUSTRIAL		SAME
RECREATIONAL		SAME
GREENVILLE COUNTY LAND USE		
AGRICULTURAL		SAME
COMMERCIAL		SAME
INDUSTRIAL		SAME
MULTI-FAMILY		SAME
RESIDENTIAL		SAME
SPARTANBURG COUNTY LAND USE		
AGRICULTURAL/FORESTRY/NATURAL AREA		SAME
COMMERCIAL SERVICE		SAME
ENTERTAINMENT AND RECREATION		SAME
INDUSTRIAL		SAME
MOBILE HOME		SAME
MULTI-FAMILY		SAME
PUBLIC SERVICES		SAME
SINGLE FAMILY		SAME
UTILITIES AND INFRASTRUCTURE		SAME

LEGEND		
DESCRIPTION	EXISTING	PROPOSED
RUNWAY PROTECTION ZONE (RPZ)	N/A	
AIRPORT PAVEMENT	N/A	
GROUND VEHICLE PAVEMENT	N/A	
AIRPORT BUILDINGS	N/A	
TO BE REMOVED	N/A	
AIRPORT PROPERTY		
COUNTY BOUNDARY		SAME
NOISE CONTOURS	NOT SHOWN	
ZONING BOUNDARY		SAME
AIRPORT ENVIRONS AREA		SAME

SCALE

0 1000 2000 3000 4000

FEET

NOTES:
- AERIAL MAPPING BY WOOLPERT, 2017.
- SPARTANBURG COUNTY IS UNZONED.
- PARCEL, ZONING, AND LAND USE DATA PROVIDED BY GREENVILLE AND SPARTANBURG COUNTIES.
- RUNWAY PROTECTION ZONES ARE COMPLETELY ON AIRPORT PROPERTY.

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1980
BINGHAMTON, NEW YORK 13902 www.mjinc.com

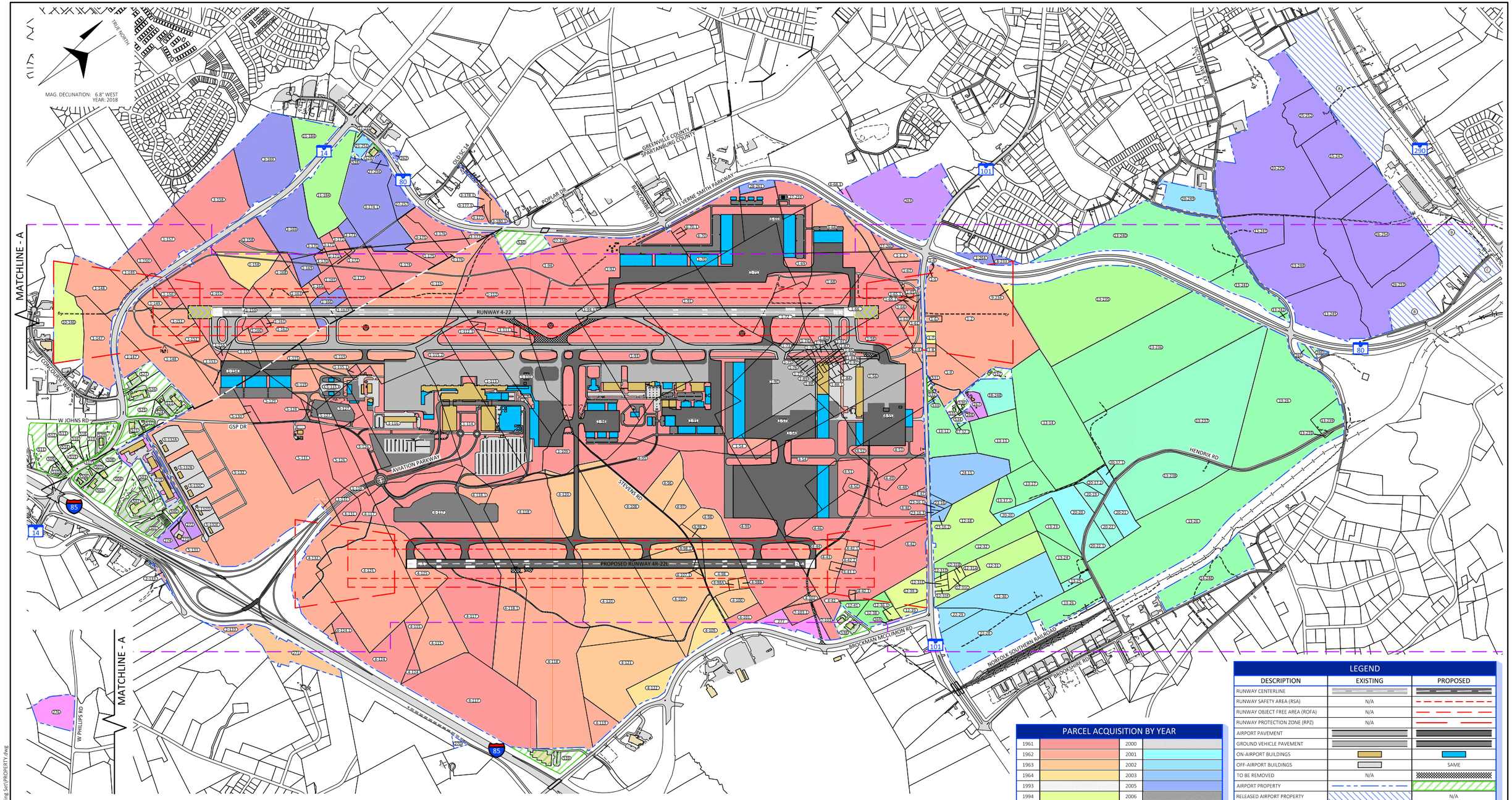
GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT
GREER, SOUTH CAROLINA

AIRPORT LAND USE AND RPZ CONTROL PLAN

SCALE:	1" = 1,000'	DESIGN: JM	SHEET: 15
DRAWN:	RGT	PROJECT: 18219.00	
CHECKED:		DATE: JANUARY 2020	

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\LAND USE.dwg

This page has been intentionally left blank.



PROPOSED AIRPORT PROPERTY - FEE SIMPLE

REFERENCE NUMBER	TAX PARCEL NUMBER	GRANTOR	ACREAGE	PURPOSE
500	9-06-00-002.10	LEDFORD JAMES DAVID	1.91	AIRSPACE CONTROL
501	9-06-00-002.08	LEDFORD JAMES DAVID	4.13	AIRSPACE CONTROL
502	9-06-00-002.05	LEDFORD JAMES DAVID	9.84	AIRSPACE CONTROL
503	9-06-00-002.09	LEDFORD JAMES DAVID	3.63	AIRSPACE CONTROL
504	9-06-00-002.06	HUSKEY CONSTRUCTION COMPANY INC	5.03	AIRSPACE CONTROL
505	9-06-00-004.02	HUSKEY CONSTRUCTION COMPANY INC	3.78	AIRSPACE CONTROL
506	9-06-00-004.00	HUSKEY CONSTRUCTION COMPANY INC	2.00	AIRSPACE CONTROL
507	9-06-00-003.00	HUSKEY BILLY B	0.86	AIRSPACE CONTROL
508	9-06-00-002.04	HUSKEY BILLY B	1.39	AIRSPACE CONTROL
509	0529020102500	ARTHUR STATE BANK	0.64	AIRSPACE CONTROL
510	0529020102503	SC DEPT OF TRANSPORTATION	0.70	AIRSPACE CONTROL
511	0529020102502	PEACHTREE JETPORT PARNTERS LLC	5.27	AIRSPACE CONTROL
512	0529020102400	ARTHUR STATE BANK	3.37	AIRSPACE CONTROL
513	0529020102200	HUSKEY CONSTRUCTION CO INC	1.82	AIRSPACE CONTROL
514	0529020102100	HENSON PEGGY S	0.59	AIRSPACE CONTROL
515	0529020102101	ENIGMA CORPORATION SC CORP	1.57	AIRSPACE CONTROL
516	0529020102000	BENNETT HENDRIX J	1.52	AIRSPACE CONTROL

PROPOSED AIRPORT PROPERTY - FEE SIMPLE

REFERENCE NUMBER	TAX PARCEL NUMBER	GRANTOR	ACREAGE	PURPOSE
517	0529020101900	SMITH K MICHAEL, SMITH NANCY HAWKINS	0.64	AIRSPACE CONTROL
518	0529020101901	SMITH BILL, SMITH FRANCES	1.23	AIRSPACE CONTROL
519	0529020101700	SPINX COMPANY INC THE	1.66	AIRSPACE CONTROL
520	0529020101506	HUSKEY CONSTRUCTION CO INC SC	3.42	AIRSPACE CONTROL
521	0529020101500	JOSEPH WARREN T	2.05	AIRSPACE CONTROL
522	0529020101600	COOPER MARILYN M	0.75	AIRSPACE CONTROL
523	0529020101501	LINCOLN LLC	4.11	AIRSPACE CONTROL
524	0529020101507	925 GSP DRIVE ASSOCIATES LLC	1.16	AIRSPACE CONTROL
525	0529020101504	CUNNINGHAM FRANCES E, CUNNINGHAM LADSON E (ETWROS)	2.12	AIRSPACE CONTROL
526	0529020101505	FLOWSERVE RED CORPORATION	5.56	AIRSPACE CONTROL
527	0529020101503	GSP TRANSPORTATION INC	3.38	AIRSPACE CONTROL
528	0529030100707	PHOENIX MECHANICAL LLC	0.30	AIRSPACE CONTROL
529	0529030100728	J VERNE SMITH PARKWAY LLC	1.29	AIRSPACE CONTROL
530	5-23-00-007.01	STOVER WILLIAM W	7.18	AIRSPACE CONTROL
531	5-23-00-012.00	PITTMAN MICHAEL F (LE)	0.15	AIRSPACE CONTROL

PROPOSED AIRPORT PROPERTY - FEE SIMPLE

REFERENCE NUMBER	TAX PARCEL NUMBER	GRANTOR	ACREAGE	PURPOSE
532	5-23-00-012.01	PITTMAN MICHAEL F (LE)	0.79	AIRSPACE CONTROL
533	5-23-00-012.02	PITTMAN MICHAEL F (LE)	0.14	AIRSPACE CONTROL
534	5-23-00-011.01	FORTNER JAMES D	0.78	AIRSPACE CONTROL
535	5-23-00-011.00	FORTNER JAMES D	1.20	AIRSPACE CONTROL
536	5-23-00-010.01	CONWELL GENE L	1.20	AIRSPACE CONTROL
537	5-23-00-010.04	ROBISON CINDY C	2.11	AIRSPACE CONTROL
538	5-23-00-049.07	SC STATE PORTS AUTHORITY	4.30	AIRSPACE CONTROL
539	5-28-00-010.01	SPARTANBURG COUNTY (FILOT)	6.86	AIRSPACE CONTROL

SCALE

0 800 1600 2400 3200

FEET

NOTES:
- AERIAL MAPPING BY WOOLPERT, 2017.
- NO PROPERTY SURVEY WAS DONE FOR THIS PROJECT.
- PROPERTY INFORMATION COMPILED FROM PARCEL DATA PROVIDED BY GREENVILLE AND SPARTANBURG COUNTIES AND "EXHIBIT "A" PROPERTY MAP" BY THE LPA GROUP, 4/16/2007.

PARCEL ACQUISITION BY YEAR

1961		2000	
1962		2001	
1963		2002	
1964		2003	
1993		2005	
1994		2006	
1995		2007	
1996		2011	
1997		2012	
1998		2014	
1999			

LEGEND

DESCRIPTION	EXISTING	PROPOSED
RUNWAY CENTERLINE		
RUNWAY SAFETY AREA (RSA)	N/A	
RUNWAY OBJECT FREE AREA (ROFA)	N/A	
RUNWAY PROTECTION ZONE (RPZ)	N/A	
AIRPORT PAVEMENT		
GROUND VEHICLE PAVEMENT		
ON-AIRPORT BUILDINGS		
OFF-AIRPORT BUILDINGS		SAME
TO BE REMOVED	N/A	
AIRPORT PROPERTY		
RELEASED AIRPORT PROPERTY		N/A
COUNTY BOUNDARY		SAME
AIRPORT PARCEL BOUNDARY		SAME
OFF-AIRPORT PARCEL BOUNDARY		SAME
AIRPORT ENVIRONS AREA		SAME
SURVEY MONUMENT		SAME

REV	DATE	DESCRIPTION	BY	SPONSOR

McFarland Johnson
49 COURT STREET, METROCENTER, PO BOX 1960
BINGHAMTON, NEW YORK 13902 www.mjinc.com

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

GREER, SOUTH CAROLINA

EXHIBIT 'A' AIRPORT PROPERTY INVENTORY MAP

SCALE:	1" = 800'	DESIGN: JM	SHEET: 16
DRAWN:	RGT	PROJECT: 18219.00	
CHECKED:		DATE: JANUARY 2020	

K:\Greenville Spartanburg\T-18219.00 GSP Master Plan\Draw\Drawings\Drawing Set\PROPERTY.dwg

This page has been intentionally left blank.

EXISTING AIRPORT PROPERTY - FEE SIMPLE

TRACT	REFERENCE NUMBER	TAX PARCEL NUMBER	PREVIOUS OWNER	ACREAGE	FEDERAL GRANT	RECORD DOCUMENT	ACQUISITION DATE
1	1.1	5-23-00-008.00	T. CORA JAMES ESTATE	2.64	FAAP 9-38-026-C404	28P/169	1962-10-26
1	2	5-23-00-009.00	LEROY MOORE	53.63	FAAP 9-38-026-C404	28E/571	1962-07-10
1	4	5-23-00-009.00	JERRY J. SMITH MAR 15, 60	0.02	FAAP 9-38-026-C404	27K/97	1961-10-17
1	5	5-23-00-009.00	BILL COMPTON MAR 15, 60	0.31	FAAP 9-38-026-C404	27K/12	1961-10-13
1	6	5-23-00-009.00	GORDON WOOD MAR 15, 60	0.66	FAAP 9-38-026-C404	27X/375	1962-04-31
1	7	5-23-00-009.00	M.W. WOOD MAR 15, 60	0.81	FAAP 9-38-026-C404	N/A	N/A
1	8	5-23-00-008.00	ANNIE GRACE WOOD MAR 15, 60	0.82	FAAP 9-38-026-C404	28L/271	1962-09-15
1	8	5-23-00-009.00	ANNIE GRACE WOOD MAR 15, 60	0.78	FAAP 9-38-026-C404	28L/271	1962-09-15
1	9	5-23-00-009.00	LEWIS W. GOSNELL MAR 15, 60	11.30	FAAP 9-38-026-C404	27W/387	1962-03-23
1	54	5-23-00-008.00	VICTOR LEE JOHNSON MAR 15, 60	6.94	FAAP 9-38-026-C404	27E/310	1961-08-05
1	54	5-23-00-008.00	VICTOR LEE JOHNSON MAR 15, 60	1.77	FAAP 9-38-026-C404	27E/310	1961-08-05
1	56	5-23-00-008.00	CLERK OF COURT WALLACE G LOVELACE	21.51	FAAP 9-38-026-C404	27U/510	1962-02-26
1	57	5-23-00-008.00	CLERK OF COURT WALLACE G LOVELACE	10.26	FAAP 9-38-026-C404	27U/510	1962-02-26
1	58	5-23-00-008.00	MRS MAMIE E WYNN	15.31	FAAP 9-38-026-C404	26Y/36	1961-05-10
1	61	5-23-00-008.00	ALBERT R. JONES & FRANCES A. JONES MAR 15, 60	3.17	FAAP 9-38-026-C404	28B/292	1962-05-25
1	63	5-23-00-008.00	AMANDA W. JONES MAR 15, 60	0.83	FAAP 9-38-026-C404	27Z/338	1962-05-11
1	64	5-23-00-008.00	WILLIAM S. ALLRED & VIRGINIA A. ALLRED MAR 15, 60	1.48	FAAP 9-38-026-C404	27L/506	1961-11-06
1	65	5-23-00-008.00	BUDDY HENDRIX MAR 15, 60	1.79	FAAP 9-38-026-C404	28C/89	1962-06-14
1	65.1	5-23-00-008.00	BUDDY HENDRIX MAR 15, 60	0.34	FAAP 9-38-026-C404	28C/89	1962-06-14
1	65.2	5-23-00-008.00	BUDDY HENDRIX MAR 15, 60	0.58	FAAP 9-38-026-C404	28C/89	1962-06-14
1	66	5-23-00-008.00	MYRTLE B. HANNAH MAR 29, 61	26.92	FAAP 9-38-026-C404	26Y/315	1961-05-15
1	67	5-23-00-008.00	E.J. ALEXANDER MAR 15, 60	3.27	FAAP 9-38-026-C404	27G/515	1961-09-11
1	68	5-23-00-008.00	MAUDE BURNETT MAR 29, 61	18.97	FAAP 9-38-026-C404	27I/352	1961-10-05
1	69	5-23-00-008.00	MYRTLE B. HANNAH MAR 15, 60	4.63	FAAP 9-38-026-C404	27G/448	1961-09-09
1	70	5-23-00-008.00	HERBERT L. MAYFIELD MAR 15, 60	2.54	FAAP 9-38-026-C404	27E/564	1961-08-10
1	71	5-23-00-008.00	C.R. HANNAH MAR 15, 60	36.75	FAAP 9-38-026-C404	26X/346	1961-05-02
1	72	5-23-00-008.00	CHARLIE D. & HELEN JENKINS MAR 15, 60	13.54	FAAP 9-38-026-C404	27N/355	1961-12-01
1	73	5-23-00-008.00	PAUL B. JACKSON ET AL MAR 15, 60	0.80	FAAP 9-38-026-C404	26V/518	1961-09-16
1	74	5-23-00-008.00	ORENE S WOOD ET AL MAR 15, 60	2.57	FAAP 9-38-026-C404	26V/521	1961-04-08
1	75	5-23-00-008.00	ELIZABETH WOOD HATCHETT MAR 15, 60	0.66	FAAP 9-38-026-C404	26V/515	1961-04-18
1	76	5-23-00-008.00	CATHERINE S. HENDERSON MOSS MAR 15, 60	0.46	FAAP 9-38-026-C404	26Z/546	1961-06-05
1	77	5-23-00-008.00	F.S. RUSHTON MAR 15, 60	0.65	FAAP 9-38-026-C404	26V/432	1961-04-07
1	78	5-23-00-008.00	RAY WILLIAMS MAR 15, 60	0.64	FAAP 9-38-026-C404	26X/396	1961-05-04
1	79	5-23-00-008.00	JAMES ARTHUR BROWN MAR 15, 60	0.63	FAAP 9-38-026-C404	26X/458	1961-05-05
1	80	5-23-00-008.00	CLERK OF COURT WALLACE G LOVELACE	0.37	FAAP 9-38-026-C404	27A/223	1961-06-09
1	81	5-23-00-008.00	J.B. BOWERS & V.L.TURNER MAR 15, 60	0.37	FAAP 9-38-026-C404	27H/479	1961-09-23
1	82	5-23-00-008.00	GARVIN DESHIELDS MAR 15, 60	1.02	FAAP 9-38-026-C404	27E/333	1961-08-07
1	83	5-23-00-008.00	JIMMY B MINYARD	0.40	FAAP 9-38-026-C404	27H/583	1961-09-26
1	84	5-23-00-008.00	JB BOWERS ET AL	0.56	FAAP 9-38-026-C404	27H/479	1961-09-23
1	85	5-23-00-008.00	P.V. MONTGOMERY MAR 15, 60	0.29	FAAP 9-38-026-C404	27D/600	1961-08-01
1	86	5-23-00-008.00	JAMES EARLE HAMBY MAR 15, 60	0.26	FAAP 9-38-026-C404	27C/117	1961-07-06
1	87	5-23-00-008.00	BOYD A GODFREY & RUTH GODFREY MAR 15, 60	0.23	FAAP 9-38-026-C404	27C/219	1961-07-07
1	88	5-23-00-008.00	E.J. HARRISON & BERTHA W. HARRISON MAR 15, 60	0.41	FAAP 9-38-026-C404	27E/307	1961-08-05
1	88.1	5-23-00-008.00	E.J. HARRISON & BERTHA W. HARRISON MAR 15, 60	1.21	FAAP 9-38-026-C404	27E/307	1961-08-05
1	89	5-23-00-008.00	J.P. BYARS & ROY E. BYARS MAR 15, 60	0.50	FAAP 9-38-026-C404	27F/240	1961-08-19
1	90	5-23-00-008.00	LEROY WOOD MAR 15, 60	35.58	FAAP 9-38-026-C404	26X/509	1961-05-05
1	91	5-23-00-008.00	PAUL M. WOOD MAR 15, 60	87.18	FAAP 9-38-026-C404	27K/110	1961-10-17
1	92	5-23-00-008.00	WILLIAM C. & MARGARET MAYFIELD GLENN MAR 15, 60	41.63	FAAP 9-38-026-C404	26X/461	1961-05-05
1	93	5-23-00-008.00	CLEVELAND ROGERS MAR 15, 60	47.20	FAAP 9-38-026-C404	26V/435	1961-04-07
1	94	5-23-00-008.00	MELVIN W. BAILEY MAR 15, 60	84.42	FAAP 9-38-026-C404	26Y/321	1961-05-15
1	94.1	5-23-00-008.00	MELVIN W. BAILEY MAR 15, 60	1.64	FAAP 9-38-026-C404	26Y/318	1961-05-15
1	109	5-23-00-008.00	PORTER COX ET AL MAR 15, 60	11.38	FAAP 9-38-026-C404	27S/356	1961-01-31
1	110	5-23-00-008.00	NANNIE J. SMITH MAR 15, 60	21.76	FAAP 9-38-026-C404	26Y/657	1962-05-23
1	111	5-23-00-008.00	ALVIN & HELEN HOLLINGSWORTH MAR 15, 60	0.51	FAAP 9-38-026-C404	26X/240	1961-05-01
1	112	5-23-00-008.00	AB HOLLINGSWORTH ET AL MAR 15, 60	31.07	FAAP 9-38-026-C404	26X/44	1961-04-25
1	112.1	5-23-00-008.00	ROBERT AMOS WITT & WILLIE MAE WITT APR 12, 61	0.63	FAAP 9-38-026-C404	26Y/297	1961-05-15
1	113	5-23-00-008.00	M.C. DONNAN MAR 15, 60	40.01	FAAP 9-38-026-C404	27I/349	1961-10-05
1	114	5-23-00-008.00	GRACE D WOOD ET AL	39.08	FAAP 9-38-026-C404	26Z/466	1961-06-02
1	115	5-23-00-008.00	MILFORD C BURNETT ET AL	71.68	FAAP 9-38-026-C404	27T/54	1962-02-06
1	115	9-06-00-001.00	MILFORD C BURNETT ET AL	4.21	FAAP 9-38-026-C404	27T/54	1962-02-06
1	115.1	5-23-00-008.00	MILFORD C. BURNETT MAR 15, 60	0.71	FAAP 9-38-026-C404	26Y/404	1961-05-16
1	115.2	5-23-00-008.00	N/A	4.91	FAAP 9-38-026-C404	N/A	N/A
1	116	5-23-00-008.00	M.C. DONNAN MAR 15, 60	55.92	FAAP 9-38-026-C404	27I/349	1961-10-05
1	116	9-06-00-001.00	M.C. DONNAN MAR 15, 60	1.78	FAAP 9-38-026-C404	27I/349	1961-10-05
1	131	9-06-00-001.00	ROBERT E. JONES & HAZEL B. JONES MAR 15, 60	2.37	FAAP 9-38-026-C404	27J/13	1961-09-28
1	132	9-06-00-001.00	N.J. AYERS JUN 23, 60	1.08	FAAP 9-38-026-C404	N/A	N/A
1	147	0529020100100	EARL E. MCCALL	20.71	FAAP 9-38-026-C404	698/538	1962-05-25
1	148	0529020100100	J.E. MCCALL	41.38	FAAP 9-38-026-C404	699/73	1962-05-28
1	149	0529020100100	NELLIE B.M. GREEN	8.88	FAAP 9-38-026-C404	704/404	1962-08-15
1	150	0529020100100	MAGARET RUTH M. MATHIS MAR 15, 60	7.30	FAAP 9-38-026-C404	681/494	1961-09-11
1	151	0529020100100	MARY E.M. BRIDGES MAR, 60	4.11	FAAP 9-38-026-C404	702/223	1962-07-13
1	152	0529020100100	E.L. MAYFIELD MAR 15, 60	3.72	FAAP 9-38-026-C404	704/285	1962-08-13
1	153	0529020100100	NELLIE B.M. GREEN MAR, 60	4.43	FAAP 9-38-026-C404	704/404	1962-08-15
1	154	0529020100100	E.L. MAYFIELD MAR 15, 60	6.77	FAAP 9-38-026-C404	704/285	1962-08-13
1	155	0529020100100	MARY E.M. BRIDGES MAR, 60	4.46	FAAP 9-38-026-C404	702/223	1962-07-13
1	156	0529020100100	MAGARET RUTH M. MATHIS	0.69	FAAP 9-38-026-C404	681/494	1961-09-11
1	157	0529030100900	JAMES L. KNIGHT	45.53	FAAP 9-38-026-C404	680/497	1961-08-25
1	158	0529030100900	CLARENCE E. BALLENGER	9.83	FAAP 9-38-026-C404	741/411	1964-02-04
1	159	0529020100100	JAMES C. HOWARD	4.63	FAAP 9-38-026-C404	687/437	1961-12-01
1	160	0529020100100	HENRY E. BRYANT	1.60	FAAP 9-38-026-C404	688/343	1961-12-13
1	161	0529020100100	W. DENNIS SMITH	0.45	FAAP 9-38-026-C404	688/346	1961-12-13
1	162	0529020100100	JAMES R. GREEN ESTATE C/O BIRNEY BLIND	26.84	FAAP 9-38-026-C404	709/375	1962-10-18
1	163	0529010100100	JACK HUBERT SMITH	1.12	FAAP 9-38-026-C404	695/130	1962-03-26
1	164	0529010100100	JULIUS F. SMITH, ET. AL.	1.26	FAAP 9-38-026-C404	678/215	1961-07-19
1	165	0529010100100	JAMES C. SMITH	2.44	FAAP 9-38-026-C404	675/76	1961-05-31
1	166	0529010100100	J.F. SMITH C/O BIRNEY BLIND	5.50	FAAP 9-38-026-C404	680/474	2006-03-17
1	167	0529010100100	JIMMIE NELL S. BLACKMAN	1.65	FAAP 9-38-026-C404	675/273	1961-06-07
1	168	0529010100100	JULIUS F. SMITH	1.14	FAAP 9-38-026-C404	678/215	1961-08-19
1	169	0529010100100	J.F. SMITH C/O BIRNEY BLIND	3.86	FAAP 9-38-026-C404	680/474	2006-03-17
1	170	0529010100100	ALBERT L. SMITH & LOUISE W. SMITH	1.49	FAAP 9-38-026-C404	671/456	1961-04-10
1	171	0529010100100	PAUL A. JORDON	0.93	FAAP 9-38-026-C404	679/217	1961-08-03
1	172	0529010100100	W. HENRY BURNETT	0.47	FAAP 9-38-026-C404	679/437	1961-08-10

EXISTING AIRPORT PROPERTY - FEE SIMPLE

TRACT	REFERENCE NUMBER	TAX PARCEL NUMBER	PREVIOUS OWNER	ACREAGE	FEDERAL GRANT	RECORD DOCUMENT	ACQUISITION DATE
1	173	0529010100100	HENRY BURNETT, ET. AL.	14.66	FAAP 9-38-026-C404	674/492	1961-05-29
1	174	0529010100100	CLARENCE SMITH	9.49	FAAP 9-38-026-C404	677/280	1961-07-07
1	175	0529010100100	MILTON T. SMITH	1.91	FAAP 9-38-026-C404	679/251	1961-08-04
1	176	0529010100100	JOE B. SMITH	0.33	FAAP 9-38-026-C404	679/220	1961-08-03
1	264	9-05-02-012.00	N/A	1.92	FAAP 9-38-026-C404	N/A	N/A
2	133	9-06-00-001.00	P.L. SMITH SR.	2.34	N/A	28C/366	1962-06-09
3	158	0529030100900	CLARENCE E. BALLENGER	33.38	N/A	741/411	1961-02-04
3	169	0529010100100	J.F. SMITH C/O BIRNEY BLIND	45.60	N/A	680/474	2006-03-17
3	170	0529010100100	ALBERT L. SMITH & LOUISE W. SMITH	0.12	N/A	671/456	1961-04-10
3	171	0529010100100	PAUL A. JORDON	1.30	N/A	679/217	1961-08-03
3	172	0529010100100	W. HENRY BURNETT	1.59	N/A	679/437	1961-08-10
3	173	0529010100100	J.F. SMITH C/O BIRNEY BLIND	2.75	N/A	680/474	2006-03-17
3	174.1	0529010100100	J.F. SMITH C/O BIRNEY BLIND	28.33	N/A	680/474	2006-03-17
3	175	0529010100100	MILTON T. SMITH	5.15	N/A	679/251	1961-08-04
3	176	0529010100100	JOE B. SMITH	7.84	N/A	679/220	1961-08-03
3	177	0529010100100	LOUIE FOSTER & FRANCES G. FOSTER	1.40	N/A	681/491	1961-09-11
3	177	0529010100100	LOUIE FOSTER & FRANCES G. FOSTER	1.63	N/A	681/474	1961-09-11
3	177.1	0529010100100	CHARLES R. GOSNELL & GLADYS E. GOSNELL	0.07	N/A	681/345	1961-09-07
3	178.1	0529010100100	GORDON SMITH	1.68	N/A	694/385	1962-08-19
3	180.1	0529010100100	W.D. SMITH ESTATE	3.08	N/A	693/97	1962-02-23
4	42	5-23-00-008.00	J.P. BYARS EST. MAR 15, 60	28.56	N/A	27F/240	1961-08-09
4	42.1	5-23-00-008.00	VANCE G. & JAUNITA W. BYARS MAR 15, 60	1.20	N/A	27Y/533	1962-04-23
4	42.2	5-23-00-008.00	ROY E. BYARS MAR 15, 60	0.93	N/A	27X/316	1962-04-21
4	42.3	5-23-00-008.00	PAULINE G. BURNETT MAR 15, 60	0.42	N/A	27X/86	1962-03-29
4	43	5-23-00-008.00	ROY E BYARS ET AL MAR 15, 60	8.62	N/A	28N/485	1962-10-19
4	43.1	5-23-00-008.00	JAMES LEX BYARS MAR 15, 60	0.62	N/A	27Y/533	1962-04-11
4	44	5-23-00-008.00	RALPH C. DESHIELDS MAR 15, 60	5.00	N/A	27U/117	1962-02-20
4	46	5-23-00-008.00	M.G. DESHIELDS MAR 15, 60	32.30	N/A	27E/330	1961-08-07
4	47	5-23-00-008.00	DUDLEY L. LYNN & GRACE H. LYNN MAR 15, 60	0.56	N/A	27E/17	1961-08-02
4	48	5-23-00-008.00	O.P. ANDERS SR. MAR. 15, 60	9.45	N/A	27E/633	1961-08-11
4	49	5-23-00-008.00	GRACE JOHNSON WOFFORD MAR 15, 60	2.49	N/A	27E/614	1961-08-11
4	50	5-23-00-008.00	JOHN LEE & LOREE M. EDGE MAR 15, 60	1.79	N/A	27E/608	1961-08-11
4	51	5-23-00-008.00	FRED M. EDGE & LOIS W. EDGE MAR 15, 60	12.09	N/A	27E/611	1961-08-11
4	52	5-23-00-008.00	OLLIE MAE JOHNSON MAR 15, 60	1.50	N/A	27E/313	1961-08-05
4	53	5-23-00-008.00	THOMAS MILTON JOHNSON MAR 15, 60	15.93	N/A	27F/21	1961-08-12
4	54	5-23-00-008.00	VICTOR LEE JOHNSON MAR 15, 60	44.56	N/A	27E/310	1961-08-05
4	55	5-23-00-008.00	HAZEL JOHNSON BRAMLETT MAR 15, 60	20.04	N/A	27F/288	1961-08-21
4	95	5-23-00-008.00	LEROY WOOD ET AL	15.32	N/A	26Y/214	1961-05-12
4	96	5-23-00-008.00	M.M. PHILLIPS MAR 15, 60	7.57	N/A	28Z/566	1963-03-30
4	97	5-23-00-008.00	MRS. B.E. SATTERFIELD MAR 15, 60	6.11	N/A	28Z/602	1963-04-01
4	98	5-23-00-008.00	W.R. LEONARD MAR 15, 60	18.13	N/A	29P/480	1963-10-14
4	98.1	5-23-00-008.00	W.R. LEONARD MAR 15, 60	0.86	N/A	29P/480	1963-10-14
4	98.2	5-23-00-008.00	W.R. LEONARD MAR 15, 60	2.68	N/A	29P/480	1963-10-14
4	98A	5-23-00-008.00	JAMES LEONARD & PEGGY T. LEONARD MAR 15, 60	0.73	N/A	29L/519	1963-08-31
4	98B	5-23-00-008.00	WILLIAM JAMES ENSLEY & VIRGINIA LEONARD ENSLEY MAR 15, 60	0.68	N/A	29L/178	1963-08-26
4	99	5-23-00-008.00	J.P. BYERS EST MAR 15, 60	60.56	N/A	27F/240	1961-08-19
4	100	5-23-00-008.00	S.L. WADDELL MAR 15, 60	5.12	N/A	29E/165	1963-05-29
4	101	5-23-00-008.00	J.P. BYERS EST MAR 15, 60	3.50	N/A	29F/240	1961-08-19
4	102	5-23-00-008.00	B.P. JOHNSON JAN 22, 62	1.43	N/A	27U/396	1962
4	105	5-23-00-008.00	HOMER E. DAVIS MAR 15, 60	7.42	N/A	30E/358	1964-05-19
4	107	5-23-00-008.00	CARL HAWKINS ET AL	29.63	N/A	29E/430	1963-06-03
4	107.1	5-23-00-008.00	CARL HAWKINS ET AL	0.54	N/A	29E/430	1963-06-03
4	108	5-23-00-008.00	WILSON WADDELL & EDITH B. WADDELL MAR 15, 60	32.48	N/A	29Q/11	1963-10-18
4	115	5-23-00-008.00	MILFORD C BURNETT ET AL	15.65	N/A	27T/54	1962-02-06
4	115	9-06-00-001.00	MILFORD C BURNETT ET AL	3.95	N/A	27T/54	1962-02-06
4	117	5-23-00-008.00	J. ARTHUR WOOD MAR 15, 60	77.54	N/A	27H/181	1961-09-16
4	117	5-23-00-008.00	J. ARTHUR WOOD MAR 15, 60	45.83	N/A	27H/181	1961-09-16
4	117	9-06-00-001.00	J. ARTHUR WOOD MAR 15, 60	3.62	N/A	27H/181	1961-09-16
4	118	5-23-00-008.00	WILLIAM PAUL DAVIS MAR 15, 60	109.72	N/A	27Y/160	1962-04-12
4	118.1	5-23-00-008.00	WILLIAM PAUL DAVIS MAR 15, 60	32.40	N/A	27Y/160	1962-04-12
4	119	5-23-00-008.00	WILLIAM PAUL DAVIS MAR 15, 60	5.26	N/A	27Y/160	1962-04-12
4	120	5-23-00-008.00	ALTON J WOOD ET AL	65.10	N/A	29A/44	1963-04-02
4	121	5-23-00-008.00	DEE A WOOD, TRUSTEE, ET AL	35.22	N/A	29A/541	1963-04-10
4	122	5-23-00-008.00	CLERK OF COURT WALLACE G LOVELACE	5.98	N/A	30A/89	1964-03-18
4	124	5-23-00-008.00	DEE A. WOOD MAR 15, 60	1.70	N/A	27H/476	1961-09-23
4	124	9-06-00-001.00	DEE A. WOOD MAR 15, 60	16.86	N/A	27H/476	1961-09-23
4	124.1	9-06-00-001.00	EVA WESTMORELAND JAN 20, 62	0.86	N/A	N/A	N/A
4	125	5-23-00-008.00	CLERK OF COURT WALLACE G LOVELACE	10.97	N/A	27T/305	1962-02-10
4	125	9-06-00-001.00	CLERK OF COURT WALLACE G LOVELACE	55.24	N/A	27T/305	1962-02-10
4	131	9-06-00-001.00	ROBERT E. JONES & HAZEL B. JONES MAR 15, 60	2.48	N/A	27J/13	1961-09-28
4	132	9-06-00-001.00	EVA D WESTMORELAND	18.65	N/A	27T/329	1962-02-12
5	115	5-23-00-008.00	MILFORD C BURNETT	3.33	N/A	27T/ 54	1962-02-06
5	115	9-06-00-001.00	MILFORD C BURNETT	8.44	N/A	27T/54	1962-02-06
5	126	5-23-00-008.00	M.C. DONNAN MAR 15, 60	10.80	N/A	27J/349	1961-10-05
5	126	9-06-00-001.00	M.C. DONNAN MAR 15, 60	8.71	N/A	27J/349	1961-10-05
5	127	5-23-00-008.00	M.C. DONNAN MAR 15, 60	5.86	N/A	27J/349	1961-10-05
5	127	9-06-00-001.00	M.C. DONNAN MAR 15, 60	2.76	N/A	27J/349	1961-10-05
5	128	9-06-00-001.00	JOHNNIE W. & BETTY HUMPHRIES MAR 15, 60	1.25	N/A	27J/10	1961-09-28
5	129	9-06-00-001.00	CHARLES A. JORDAN MAR 15, 60	15.81	N/A	27K/15	1961-10-13
5	130	9-06-00-001.00	P.L. SMITH JR. MAR 15, 60	0.92	N/A	27K/308	1961-10-20
5	131	9-06-00-001.00	ROBERT E. JONES & HAZEL B. JONES MAR 15, 60	25.80	N/A	27J/13	1961-09-28
5	132	9-06-00-001.00	EVA D WESTMORELAND	91.53	N/A	27T/329	1962-02-12
5	132A	9-06-00-001.01	CLERK OF COURT WALLACE G LOVELACE	4.62	N/A	28D/253	1962-06-20
5	132B	9-06-00-001.02	CLERK OF COURT WALLACE G LOVELACE	4.23	N/A	28D/253	1962-06-20
5	132C	9-06-00-001.03	CLERK OF COURT WALLACE G LOVELACE	3.34	N/A	28D/253	1961-06-20
5	132D	9-06-00-001.04	CLERK OF COURT WALLACE G LOVELACE	2.07	N/A	28D/253	1961-06-20
5	132E	9-06-00-001.05	CLERK OF COURT WALLACE G LOVELACE	2.07	N/A	28D/253	1961-06-20
5	133	9-06-00-001.00	P.L. SMITH SR. MAR 15, 60	3.91	N/A	28C/366	1962-06-09
6	68	5-23-00-008.00	MAUDE EFFIE BURNETT MAR 29, 61	16.58	N/A	27J/352	1962-10-05
6	68.1	9-05-06-002.00	AIRPORT INDUSTRIAL PARK, LLC	0.57	N/A	107M/643	2014-10-28
6	69	5-23-00-008.00	MYRTLE B. HANNAH MAR 15, 60	19.28	N/A	27G/448	1961-09-09
6	70	5-23-00-008.00	HERBERT LEE MAYFIELD MAR 15, 60	20.51	N/A	27E/561	1961-08-10

EXISTING AIRPORT PROPERTY - FEE SIMPLE

TRACT	REFERENCE NUMBER	TAX PARCEL NUMBER	PREVIOUS OWNER	ACREAGE	FEDERAL GRANT	RECORD DOCUMENT	ACQUISITION DATE
6	70.1	5-23-00-008.00	WILLIAM LEE MAYFIELD MAR 15, 60	0.58	N/A	27E/564	1961-08-10
7	103	5-23-00-008.00	N/A	3.12	N/A	N/A	N/A
7	103.1	5-23-00-008.00	N/A	3.13	N/A	N/A	N/A
8	233	9-05-02-012.00	N/A	1.19	AIP 3-45-0028-16	N/A	N/A
9	234	5-23-00-009.00	CLYDE B DOBSON	0.88	AIP 3-45-0028-19	60Q/92	1993-10-18
10	146	0529030101611	PHILLIPS ROAD PARTNERSHIP	15.97	AIP 3-45-0028-19	1568/244	1994-06-16
11	184	0529010100600	JANIE B MAYFIELD ESTATE	28.59	AIP 3-45-0028-19	1640/1696	1996-05-02
12	18	5-23-00-024.00	CECIL B THACKSTON	19.11	N/A	63T/915	1995-01-01
12	30	5-23-00-027.02	LIGON PROPERTIES, LLC	25.74	N/A	76J/901	2002-08-30
12	31	5-23-00-026.00	BUDDY & EULA HENDRIX	14.81	N/A	62Y/62	1995-06-01
12	31A	5-23-00-026.01	LARRY D OLIVER & BARABRA B OLIVER	1.20	N/A	61X/529	1994-09-01
12	31B	5-23-00-026.02	FRED M PAINTER	0.61	N/A	61T/210	1994-08-01
12	31C	5-23-00-026.06	BUDDY BRIAN LYNN	1.01	N/A	61S/233	1994-08-01
12	31D	5-23-00-026.03	D. STEVE ROGERS SR & RUBY LEE ROGERS	0.42	N/A	62D/771	1994-07-01
12	31E	5-23-00-026.05	LOI VAN & LAN ANH THINGUYEN	0.49	N/A	61L/122	1994-05-27
12	31F	5-23-00-026.04	THOMAS E HOWARD	0.45	N/A	61P/882	1994-07-08
12	32	5-23-00-025.00	REPUBLIC INVESTMENT PROPERTIES INC	13.48	N/A	65C/519	1996-12-01
12	36.1	5-23-00-034.00	JEROM L GRAYDON	1.01	N/A	61P/338	1994-07-01
12	38	5-23-00-046.00	PHILLIP D DAVIS	4.86	N/A	66V/896	1997-01-01
12	39	5-23-00-034.00	JEROME L GRAYDON	2.00	N/A	61P/338	1994-07-01
12	39.1	5-23-00-033.00	BROADUS A GRAYDON	6.96	N/A	61M/552	1994-06-14
12	41	5-23-00-047.00	W CARL SMITH	1.80	N/A	66D/836	1997-06-01
13	12	5-23-00-013.00	JBGC LIMITED PARTNERSHIP	12.31	N/A	68J/072	1998-08-07
13	13	5-23-00-013.00	JBGC LIMITED PARTNERSHIP	15.23	N/A	68J/072	1998-08-07
13	14	5-18-00-025.00	CLYDE B DOBSON	47.62	N/A	67Z/855	1998-06-01
13	17	5-23-00-018.02	GARY W HENDRIX	8.84	N/A	68B/650	1998-06-01
13	17.1	5-23-00-018.01	GARY W HENDRIX	4.06	N/A	68B/650	1998-06-01
13	23	5-23-00-022.00	ANSEL B TAYLOR	8.52	N/A	68L/721	1998-08-28
13	24	5-23-00-022.00	ANSEL B TAYLOR	7.27	N/A	68L/721	1998-08-28
13	25	5-23-00-023.00	OSIE MAE P GREGORY	1.89	N/A	73G/168	2000-11-01
13	26	5-23-00-032.00	GT&W INC OF GASTONIA	132.66	N/A	68E/632	1998-07-01
13	235	5-18-00-025.00	REPUBLIC INVESTMENT PROPERTIES INC	66.92	N/A	65C/519	1996-11-01
13	236	5-18-00-029.00	CORINNE D BYRNSIDE	78.51	N/A	67Z/852	1

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN

A VISION FOR THE FUTURE

DECEMBER 2019

APPENDICES

McFarland Johnson

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

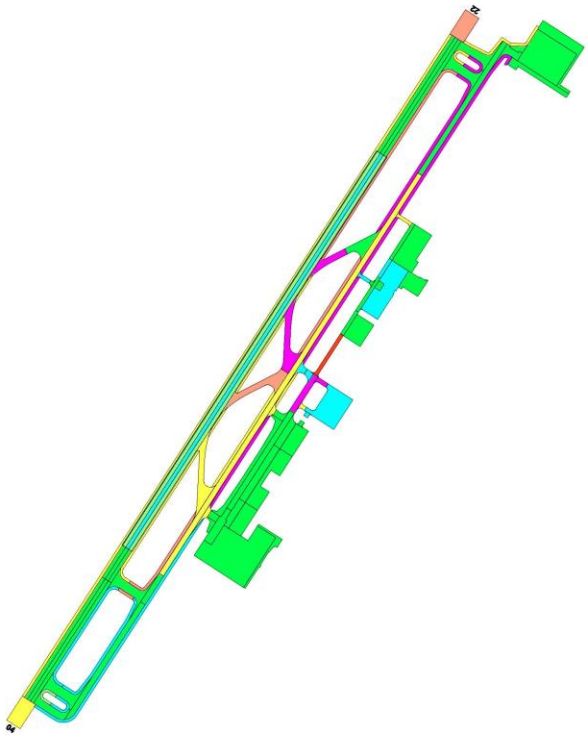
DECEMBER 2019

AIRPORT MASTER PLAN UPDATE
APPENDIX A: PAVEMENT MANAGEMENT PLAN

McFarland Johnson

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

GREENVILLE-SPARTANBURG AIRPORT DISTRICT



GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

Executive Summary
Volume 1 of 2 – Summary Report
Volume 2 of 2 - Appendices

AUGUST 2018

Prepared By

AVCON

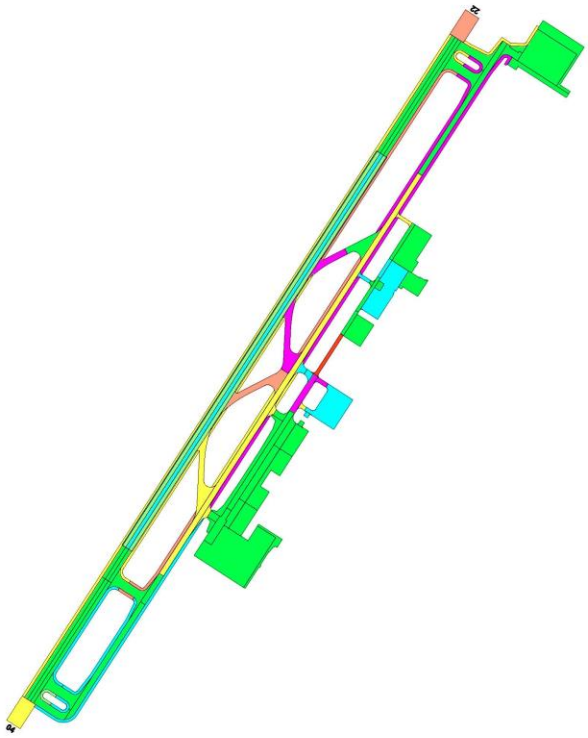
AVCON, Inc.

In Association With

McFarland Johnson

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

GREENVILLE-SPARTANBURG AIRPORT DISTRICT



GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

Executive Summary

AUGUST 2018

Prepared By

AVCON

AVCON, Inc.

In Association With

McFarland Johnson

EXECUTIVE SUMMARY

E.1 EXECUTIVE SUMMARY

In 2017, McFarland Johnson selected AVCON, Inc. to prepare the Pavement Management Plan (PMP) Update for Greenville Spartanburg International Airport (GSP). The PMP, also known as an Airfield Pavement Management System (APMS) for airside pavements is included in the Master Plan Update prepared by McFarland Johnson. The complete PMP includes the following components:

- Nondestructive Testing for Airside Pavements
- Visual Pavement Inspections
- PCN Computation
- Structural Evaluation
- Rehabilitation Recommendations
- Evaluation Report

This report contains the data gathered in the field and its analysis, rehabilitation recommendations, approximate cost estimates, and pertinent tables, figures and exhibits to support the aforementioned components. To accurately evaluate the airfield pavement condition, AVCON performed a Pavement Condition Index (PCI) survey inspection at GSP in June 2017. The PCI survey inspection is regulated by the FAA Advisory Circular 150/5380-7B *Airport Pavement Management Program (PMP)* and ASTM D5340-12 *"Standard Test Method for Airport Pavement Condition Index Surveys"*.

During the field inspection, qualified inspectors assessed the pavement condition in accordance with ASTM D5340-12, recording specific pavement distresses and their respective severity level. The use of MicroPaver software converts the number and severity of all distresses to a single PCI value for each pavement sample and section, ranging from 0 (failed) to 100 (excellent). The PCI analysis provides an indication of the degree of maintenance, repair, or rehabilitation efforts that will be required to sustain functional airfield pavement. Relative to PCI, functional pavement is represented by a PCI value greater than 40 and the critical PCI value to engage major rehabilitation is established as 70 for runways and 65 for taxiways and aprons. **Figure E.1** visually identifies the pavement areas and their area-weighted PCI values. **Table E.1** lists the area-weighted PCI values by branch for the entire airfield and highlights the pavement sections with an area-weighted PCI value below the critical PCI value established for that specific use of pavement. Further discussion on the PCI values and PCI forecast can be found in **Chapter 3.**

The overall area-weighted PCI for GSP is 81, indicating the pavements are generally in very good condition.

Runway 4 PCC pavement in excellent shape with no major pavement distresses (right)

Branch ID	Use	Area (SF)	Weighted Average PCI
RW04	Runway	1,650,000	87
BP	Overrun	176,000	62
ACARGON	Apron	518,176	94
ACARGOS	Apron	546,129	93
AGEN	Apron	556,391	92
AITIN	Apron	200,434	71
ATERM	Apron	465,289	100
FS	Apron	8,076	82
TL01	Taxilane	314,446	90
TL02	Taxilane	110,125	79
TWA	Taxiway	50,053	99
TWB	Taxiway	81,551	98
TWC	Taxiway	85,241	98
TWCARGO	Taxiway	49,399	93
TWD	Taxiway	107,176	68
TWE	Taxiway	100,487	58
TWF	Taxiway	100,487	49
TWG	Taxiway	107,026	77
TWJ	Taxiway	82,457	98
TWK	Taxiway	70,383	99
TWL	Taxiway	842,818	76
TWL2	Taxiway	41,980	85
TWL3	Taxiway	26,818	83
TWL4	Taxiway	26,657	73
TWL5	Taxiway	11,828	82
TWL6	Taxiway	11,403	56
SHRW04	Shoulder	741,091	67
SHTWC	Shoulder	8,503	55
SHTWK	Shoulder	46,553	66
SHTWL	Shoulder	731,472	58

Table E.1 – Area-Weighted Average PCI

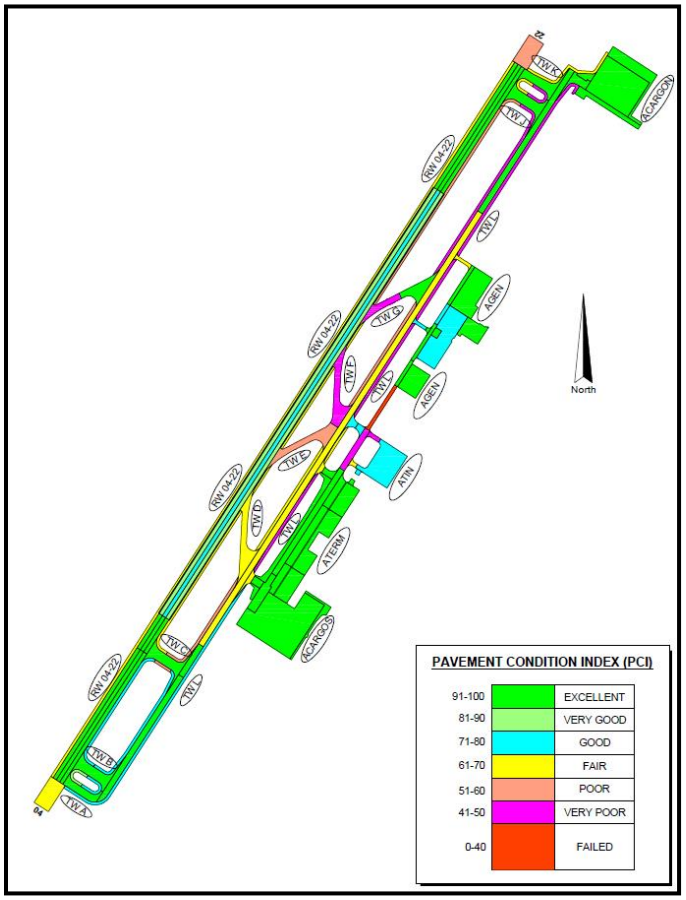


Figure E.1 – Pavement Condition Index (PCI) Rating Map

In addition to the PCI analysis, AVCON also performed an analysis of the structural capacity of the existing pavement structures and an analysis of the current and forecast fleet mix utilizing the airfield. **Figure E.2** visually identifies the pavement areas with structural capacity concerns. **Table E.2** lists the pavement sections that have been identified as having from a structural remaining life less than 20 years and highlights pavement sections that may require weight or traffic restrictions. Further discussion of the remaining life analysis can be found in **Chapter 4.**

Branch ID	Section ID	Surface Type	Structural Remaining Life (Years)
RW04	10, 20, 30, 40, 50, 60	PCC	3.2
	100, 110, 120	PCC	5
TL02	10, 30	PCC	0
	15	PCC	0.1
TWA	10	PCC	3.4
TWB	10	PCC	1.4
TWC	10	PCC	8.7
TWCARGO	10	PCC	0.6
TWJ	10	PCC	1.5
TWK	10	PCC	1.6
TWL	10, 20	PCC	1.1
	40	PCC	0.3
TWL2	10	AAC	11.3
	20	PCC	5.6
TWL3	10	AAC	18.4
	20	PCC	6.5
TWL5	20	PCC	0.2
TWL6	10	AC	0
ACARGON	10, 30	PCC	2.4
	20	PCC	0.3
ACARGOS	20	PCC	0.5
AGEN	10, 20, 30, 40	PCC	0
AITIN	30	PCC	0
FS	10, 20	PCC	0

The existing pavement sections, in conjunction with estimated subgrade strengths and fleet mix/annual operations, for each respective pavement branch identified several areas at GSP to monitor or rehabilitate over the near term if structural deficiencies propagate at increased rates.

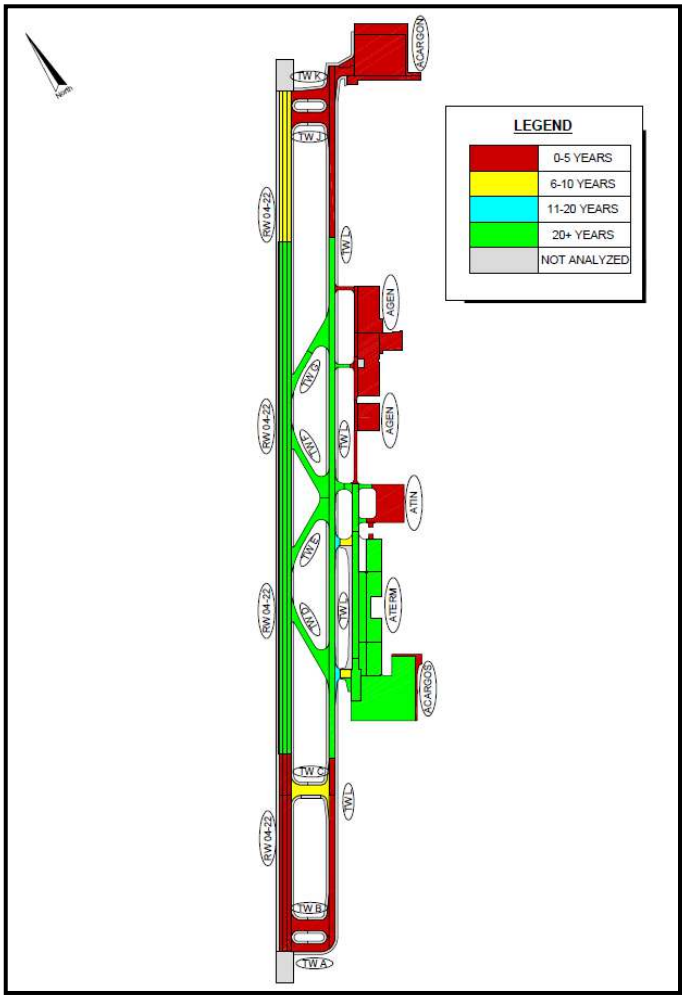


Table E.2 – Pavement Sections with Structural Remaining Life <20 years

Figure E.2 – Structural Remaining Life Map

There are several components that are considered in the priority matrix for the development of the Airfield Pavement Capital Improvements Program (CIP). The PCI values and Structural Remaining Life are only two variables in the matrix. Other variables may include the PCN value, criticality of a pavement branch and its section use, the need to rehab contiguous sections in a project, the need to make other planning related changes to meet new geometric pavement design criteria and safety initiatives, the associated lighting or drainage impacts a project may have, and of course the availability and the ability to secure sufficient funding to perform the recommended rehabilitation. Some of these variables in the matrix can be quantified, and where known items existed and could be conceptually estimated with either a lump sum rough order of magnitude figure or a relative percentage of pavement costs. Major ongoing airfield planning efforts and future landside developments have not been considered in the development of the estimated project costs.

AVCON developed a five-year CIP based on the various variables. For planning purposes, cost estimates were generated for each major rehabilitation project. **Table E.3** lists the proposed CIP rehabilitation projects and their associated estimated project costs. **Figure E.3** identifies the approximate CIP project areas and construction years and costs. Further discussion on the rehabilitation projects and their respective costs can be found in **Chapter 6** and **Appendix J**. A Maintenance Plan, as found in **Appendix K**, was also developed for near-term needs on higher severity distresses and totaled an estimated $850,000.

Priority	Design Year	Construction Year	Project Description	Total Construction Cost	Total Project Cost
1	2019	2020	**Taxiway L & High Speed Taxiways Rehabilitation** *Mill and overlay 4" on Taxiways D & G, mill and overlay 2" on Taxiway L, Taxiways L2 through L4, and shoulders and full depth reconstruction of Taxiways L5 & L6. Remove Taxiways E & F*	$ 7,845,000	$ 11,300,000
2	2020	2021	**Localized PCC Repairs and Joint Sealing - *3 Phases*** *Perform localized PCC repairs and rout, clean and seal joints on PCC portions of the South Cargo Apron, North Cargo Apron, and General Aviation*	$ 1,982,000	$ 2,900,000
3	2021	2022	**Runway 04-22 Asphalt Rehabilitation** *Mill and overlay 2" Runway, Shoulders, and Blast Pad*	$ 6,689,000	$ 9,700,000
4	2022	2023	**Localized PCC Repairs and Joint Sealing** *Perform localized PCC repairs and rout, clean, and seal joints on PCC portions of Runway 04-22 and Taxiways A, B, C, J, K & L*	$ 1,470,000	$ 2,200,000
5	2023	2024	**Reconstruct Itinerant Apron** *Full depth reconstruction on Itinerant Apron, Fire Station Apron and adjacent portion of Taxilane 2*	$ 9,564,000	$ 13,800,000
			Total Five-Year Cost	**$ 27,550,000**	**$ 39,900,000**

Table E.3 – Capital Improvement Plan (CIP) Summary

An estimated $39.9 million dollars in CIP Project funding should be budgeted for airfield pavement improvements over the next five years.

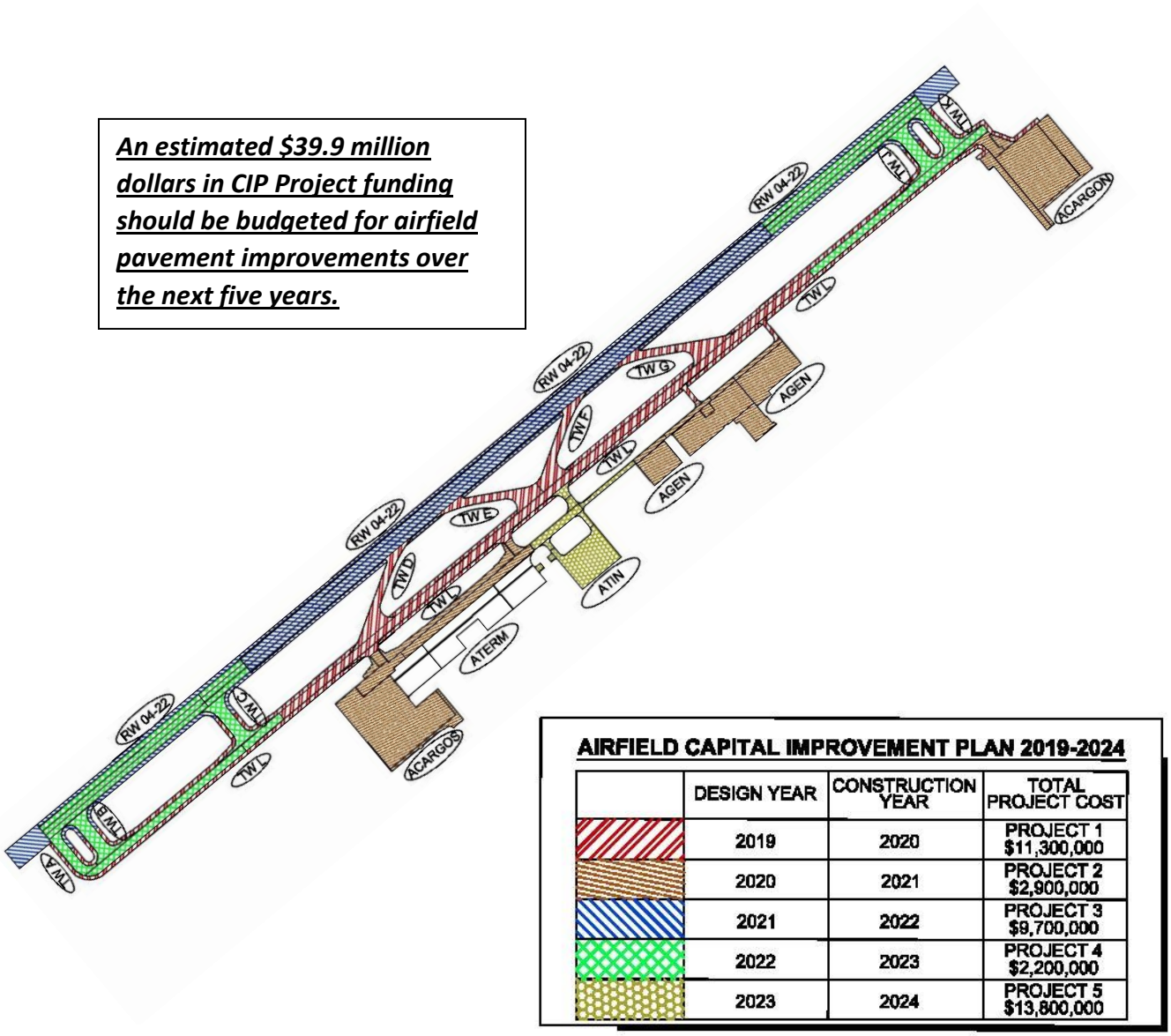
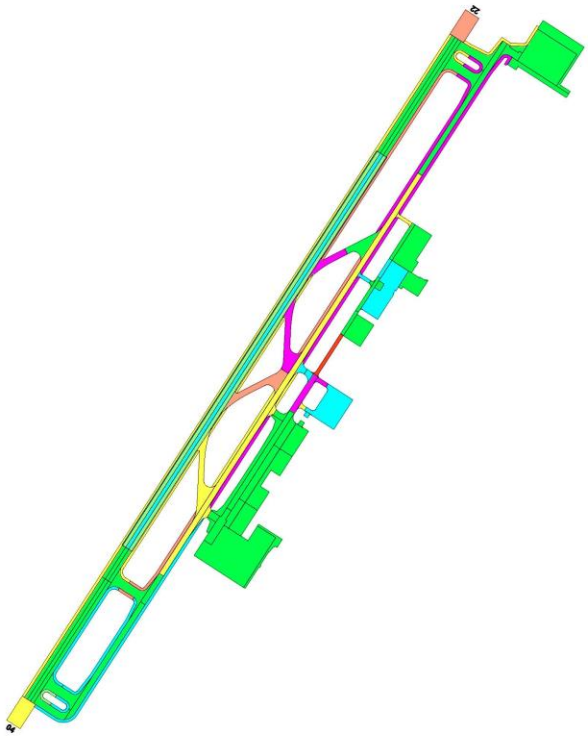


Figure E.3 – GSP Capital Improvement Plan Map

The PMP is the elemental in the planning and budgeting of airfield pavement maintenance and rehabilitation efforts. The information in this document is for planning purposes only and is intended to aid the GSAC in maintaining and enhancing the overall operation and performance of the airfield pavements at GSP. The continual updating (every 3-5 years) of this document is necessary to extract the true value in the planning process.

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

GREENVILLE-SPARTANBURG AIRPORT DISTRICT



GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

Volume 1 of 2
Summary Report

AUGUST 2018

Prepared By

AVCON

AVCON, Inc.

In Association With

McFarland Johnson

TABLE OF CONTENTS

REPORT (Volume 1)

CHAPTER 1 – Introduction

1.1 Project Overview 1-1
1.2 Project Background 1-1
1.3 Project Objectives 1-3
1.4 Project Scope of Work 1-4
1.5 Report Organization 1-4
Volume 1 – Summary Report 1-4
Volume 2 – Appendices 1-5
1.6 References 1-5

CHAPTER 2 – Systems Inventory and Network Definition Update

2.1 Overview 2-1
2.2 Historical Records Research 2-1
2.3 Network Definition 2-2
2.4 Summary 2-5

CHAPTER 3 – Pavement Condition Surveys

3.1 Overview 3-1
3.2 Pavement Condition Index (PCI) Survey Methodology 3-1
3.3 Distress Types 3-2
3.4 PCI Survey Results 3-3
Runway 04-22 3-6
Taxiway A, B, & C 3-7
Taxiway D, E, F & G 3-8
Taxiway J & K 3-9
Taxiway L 3-9
Taxiway L2 & L3 3-10
Taxiway L4, L5 & L6 3-10
Taxilane L1 & L2 3-11
Air Carrier Terminal Apron 3-12
South Air Cargo Apron 3-12
North Air Cargo Apron 3-13
Itinerant Apron 3-14
General Aviation Apron 3-15
Fire Station Ramp 1 & 2 3-16
Blast Pads 3-16
Shoulders 3-17
3.5 Summary 3-18

CHAPTER 4 – Remaining Life Analysis
4.1 Overview 4-1
4.2 Structural Remaining Life 4-1
4.3 Remaining Life Based on PCI 4-4
4.4 Remaining Life Results 4-7
4.5 Summary 4-7

CHAPTER 5 – Aircraft and Pavement Classification Numbers (ACN/PCN)
5.1 Overview 5-1
5.2 PCN Results 5-2
5.3 Interpretation of ACN/PCN Results 5-4
5.4 Summary 5-6

CHAPTER 6 – Development of Airfield Capital Improvement Program (CIP)
6.1 Overview 6-1
6.2 Development of Airfield Capital Improvement Program 6-1
Factors Considered in Selection of Candidate Projects 6-1
Ranking of Selection Factors 6-3
Prioritization of Rehabilitation Projects 6-4
Recommended Airfield Capital Improvement Program 6-6
6.3 Maintenance Plan 6-9
6.4 Summary 6-9

APPENDICES (Volume 2)
Appendix A – Network Definition Map
Appendix B – Pavement Construction History Table
Appendix C – MicroPAVER Work History Report
Appendix D – MicroPAVER Section/Branch Condition Report
Appendix E – PCI Map
Appendix F – Pavement Distress Types (with Photos)
Appendix G – Air Traffic Data
Appendix H – Remaining Life Data
Appendix I – PCN/ACN Data
Appendix J – Airfield CIP Maps and Data
Appendix K – Maintenance Plan and Summary

LIST OF FIGURES

CHAPTER 1 – Introduction
Figure 1.1 – Typical Pavement Condition Life Cycle 1-2
Figure 1.2 – General Pavement Treatments by Condition Range 1-3

CHAPTER 2 – Systems Inventory and Network Definition
Figure 2.1 – Airfield Pavement Functional Classification Use by Area 2-4
Figure 2.2 – Airfield Pavement Area vs. Surface Type 2-4

CHAPTER 3 – Pavement Condition Surveys
Figure 3.1 – Typical PCI Scale and Repair Type 3-1
Figure 3.2 – Summary of PCI Results by Surface Type 3-4
Figure 3.3 – Summary of PCI Results by Branch Use 3-4
Figure 3.4 – Pavement Condition Index (PCI) Rating Map – 2017 3-5

CHAPTER 4 – Remaining Life Analysis
Figure 4.1 – Remaining Life – Structural Analysis in FAARFIELD 4-3
Figure 4.2 – Remaining Life to Critical PCI 4-5
Figure 4.3 – Remaining Life to PCI = 40 4-6

CHAPTER 5 – Aircraft and Pavement Classification Numbers (ACN/PCN)
Figure 5.1 – ACN vs. PCN Areas of Concern 5-5

CHAPTER 6 – Development of Capital Improvement Program
Figure 6.1 – GSP Capital Improvement Plan Map 6-8

LIST OF TABLES

CHAPTER 2 – Systems Inventory and Network Definition
Table 2.1 – Construction Events Since 2016 2-1
Table 2.2 – Airfield Pavement Area by Branch Use 2-3
Table 2.3 – Airfield Pavement Area by Surface Type 2-4

CHAPTER 3 – Pavement Condition Surveys
Table 3.1 – Summary of Distresses Observed at Greenville-Spartanburg Int'l Airport 3-3
Table 3.2 – Pavement Condition Index (PCI) Summary 3-5
Table 3.3 – Runway 04-22 PCI Summary 3-6
Table 3.4 – Taxiway A, B, and C PCI Summary 3-7
Table 3.5 – Taxiway D, E, F, and G PCI Summary 3-8
Table 3.6 – Taxiway J and K PCI Summary 3-9
Table 3.7 – Taxiway L PCI Summary 3-9

Table 3.8 – Taxiway L2 and L3 PCI Summary 3-10
Table 3.9 – Taxiway L4, L5, and L6 PCI Summary 3-11
Table 3.10 – Taxilane L1 and L2 PCI Summary 3-12
Table 3.11 – Air Carrier Terminal Apron PCI Summary 3-12
Table 3.12 – South Air Cargo Apron PCI Summary 3-13
Table 3.13 – North Air Cargo Apron PCI Summary 3-13
Table 3.14 – Itinerant Apron PCI Summary 3-14
Table 3.15 – General Aviation Apron PCI Summary 3-15
Table 3.16 – Fire Station Ramp 1 and 2 PCI Summary 3-16
Table 3.17 – Blast Pads PCI Summary 3-17
Table 3.18 – Shoulder Pavement Sections PCI Summary 3-17

CHAPTER 4 – Remaining Life Analysis

Table 4.1 – Pavement Remaining Life Based on CDF Value 4-2
Table 4.2 – Standard PCI Deduction per Year 4-4
Table 4.1 – Critical PCI of Pavement Sections 4-4

CHAPTER 5 – Aircraft and Pavement Classification Numbers (ACN/PCN)

Table 5.1 – PCN Results for Critical Sections 5-2
Table 5.2 – Restricted Aircraft by Section 5-3
Table 5.3 – Typical ACN Values for Select Aircraft 5-4

CHAPTER 6 – Development of Capital Improvement Program (CIP)

Table 6.1 – Typical Repair Action Based on PCI 6-1
Table 6.2 – Priority Ranking of Selection Factors 6-3
Table 6.3 – Priority Rankings for GSP Pavements 6-4
Table 6.4 – Priority Ranking by Pavement Section 6-5
Table 6.5 – Recommended GSP Airfield CIP Summary (2019-2024) 6-7

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

CHAPTER 1: INTRODUCTION

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

CHAPTER 1 – INTRODUCTION

1.1 PROJECT OVERVIEW

From its inception in 1962, Greenville-Spartanburg International Airport (GSP), located in Greer, South Carolina, has grown to be the center of transportation for the upstate of South Carolina. GSP has maintained a steady growth throughout the last few years and is determined to meet the growing air transportation needs of South Carolina, and the southeastern United States. GSP is included in the Federal Aviation Administration (FAA) National Plan of Integrated Airport Systems for 2017-2021.

Given that GSP is the second busiest airport in South Carolina, serving over 2.1 million annual passengers in 2017, the Airport plays a critical role in the regional transportation system. Due to this constant demand on the Airport's facilities, pavement closures and other such service interruptions have a considerable impact on all Airport users. As a result, it is essential that the Airport keep airfield pavement surfaces in satisfactory operational condition at all times and maintain a program capable of timely detection and repair of deteriorating pavements that may diminish the Airport's performance. In addition, current FAA and South Carolina Department of Transportation (SCDOT) funding and grant conditions require that recipients of Federal and State grants subscribe to a progressive and continuing pavement management process in order to protect the long-term investment in capital airfield projects. Throughout the industry, such a program is known as a Pavement Management Program (PMP) or Airport Pavement Management System (APMS).

An APMS offers several benefits, including:

- Providing an objective and consistent evaluation of the condition of a network of pavements;
- Presenting a systematic and documentable engineering basis for determining maintenance and rehabilitation needs;
- Identifying budget requirements necessary to maintain pavements at various levels of serviceability;
- Documenting the present and future projected condition of the pavements in a network; and
- Identifying the impact on the pavement network as a result of performing no repairs.

1.2 PROJECT BACKGROUND

AVCON has teamed with Dynatest to evaluate the pavements at GSP and update the Airport's APMS. This APMS report provides an updated baseline validation of the pavements and specific guidance toward necessary maintenance activities as they pertain to the airfield systems at GSP. In order to facilitate the proactive management of the pavements at GSP, as well as provide a consistent framework from which to address the rate of change in pavement conditions, the APMS Update has been made an important part of the Master Plan Update.

A key component of an APMS Update is to identify rehabilitation/construction projects completed since the previous study (Statewide Airfield Pavement Management System Update, prepared by Kimley Horn and Associates, 2016) and update the network definition map accordingly. For the 2017 update, minor revisions to the network map were necessary. Extensive rehabilitation efforts have been completed on the air carrier terminal apron, which altered the respective pavement structures thus impacting the network definition map.

Another vital element of the APMS is a physical pavement inspection which is done in accordance with ASTM D5340-12 "Standard Test Method for Airport Pavement Condition Index Surveys." Most airside pavement sections were re-surveyed and assessed using the Pavement Condition Index (PCI) procedure – the industry standard in aviation for visually assessing the condition of pavements. During a PCI inspection, qualified engineers and technicians identify signs of deterioration on the surface of the pavement called distresses. The type, severity, and amount of distresses present in a pavement are documented during the pavement survey.

The results of the survey are entered in a computer pavement management database (MicroPAVER) and used to develop a composite index (PCI number). The PCI number represents the overall condition of the pavement in numerical terms, ranging from 0 (failed) to 100 (excellent), and is an indication of the level of maintenance or rehabilitation work that will be required to maintain or repair the pavement. This number also helps provide an objective means of prioritizing, scheduling, and budgeting pavement rehabilitation work. Further, the individual distress information, such as cracking or rutting, provides insight into what may be causing the pavement to deteriorate. These factors can then be used to program the appropriate maintenance or rehabilitation action to correct the problem.

Finally, the findings from the various field evaluation and data analysis activities are collectively considered in the development of a 5-Year Airfield Capital Improvement Program (CIP) for GSP. The 5-year outlook provides a budgeting tool to estimate the required resources and a timeframe in anticipation of large construction projects.

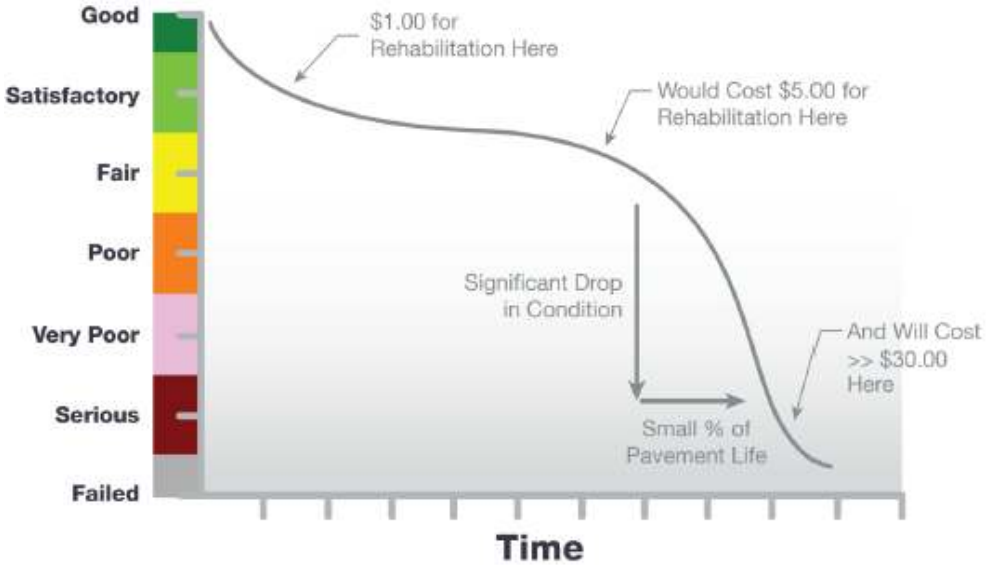


Figure 1.1 - Typical Pavement Condition Life Cycle

Figure is for conceptual purposes – unit costs are not specific to airfield pavements (AC vs PCC)

Figure 1-1 depicts the typical pavement condition life cycle, which is based on the FAA Advisory Circular 150/5380-7B *"Airport Pavement Management Program (PMP)."* This figure depicts the increasing costs associated with maintaining or rehabbing as the pavement ages. Good preventative maintenance in the early stages of a pavement's life is often more cost effective than waiting for the pavement to fail or exhibit traditional signs of distress before performing maintenance/rehabilitation. **Figure 1-2** shows the typical pavement condition life cycle of an AC pavement that receives regular treatment beginning approximately 12 years into its life.

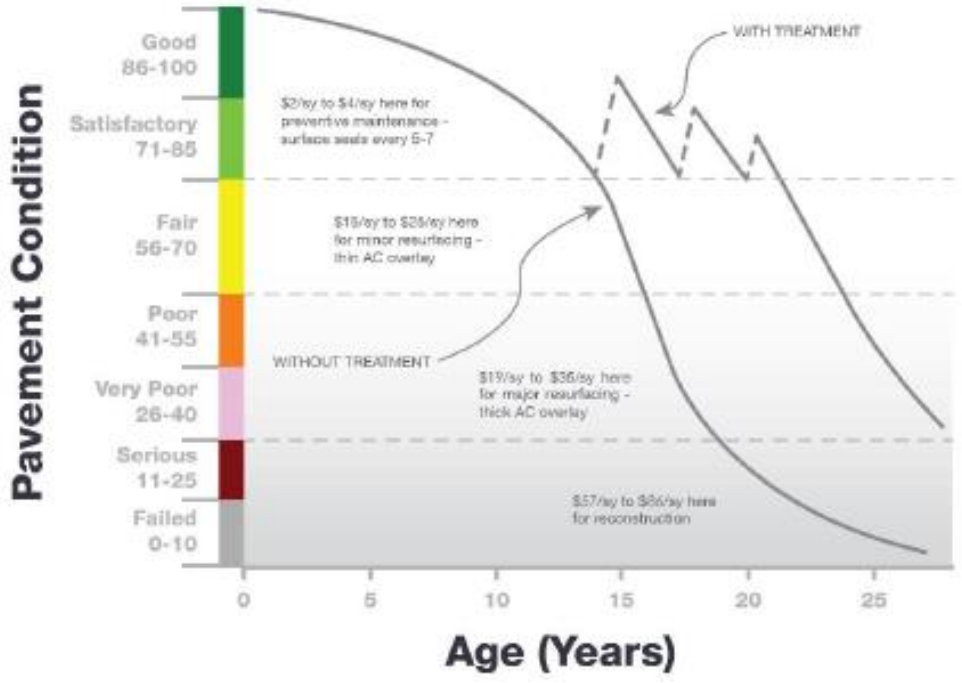


Figure 1.2 - General Pavement Treatments by Condition Range

1.3 PROJECT OBJECTIVES

The overall objectives of this study are as follows:

- Assess current airfield pavement distresses;
- Evaluate the impact of these distresses on the overall functionality of the pavements;
- Identify areas that need to be addressed both in the near future as well as long term;
- Update the existing MicroPAVER pavement management system;
- Develop an Airfield CIP for maintaining the pavements to an acceptable condition and package multiple areas into reasonable bid package projects for the District;
- Develop a Maintenance Plan to address routine airfield maintenance

1.4 PROJECT SCOPE OF WORK

The above objectives were carried out through the following tasks, which comprise the Scope of Work for this project:

- Task A – Kick-off Meeting and Project Coordination;
- Task B – Records Review;
- Task C – Update Airfield Pavement Inventory and Network Definitions;
- Task D – Incorporate Inventory and Network Definition updates into Airport's Database;
- Task E – Conduct Visual Pavement Condition Surveys and Publish PCI Results;
- Task F – Update Air Traffic Analysis, including 2017 Fleet Mix Application and New Large Aircraft (NLA);
- Task G – Update Computation of Remaining Life Analysis;
- Task H – Analyze and Tabulate Pavement Condition Numbers (PCN) per FAA Guidelines;
- Task I – Develop updates to create an Airfield CIP for a 5-year interval;
- Task J – Provide additional Site Investigation, Non-Destructive Testing and Laboratory Testing Program;
- Task K – Prepare Draft Report with Executive Summary (Technical Report and Appendices); and
- Task L – Prepare Final Report with Executive Summary (Technical Report and Appendices).

1.5 REPORT ORGANIZATION

For this update, the report will be separated into two volumes for more suitable utilization by staff. The first volume contains consolidated, results-oriented data which summarizes the project findings (Volume 1). The second volume includes appendices only and is limited to methodology, calculations, supporting data, full-sized drawings, etc., for reference (Volume 2). Below is a listing of the contents for each volume. In addition, an Executive Summary is provided as a stand-alone document.

<u>Volume 1 – Summary Report</u>

- Chapter 1 – Introduction
- Chapter 2 – Systems Inventory and Network Definition Update
- Chapter 3 – Pavement Condition Surveys
- Chapter 4 – Remaining Life Analysis
- Chapter 5 – Aircraft and Pavement Classification Numbers (ACN/PCN)
- Chapter 6 – Development of Airfield Capital Improvement Program (CIP)

Volume 2 - Appendices

- Appendix A – Network Definition Map
- Appendix B – Pavement Construction History
- Appendix C – MicroPAVER Work History
- Appendix D – Branch and Section Condition Report
- Appendix E – PCI Map
- Appendix F – Distress Types (with Photos)
- Appendix G – Air Traffic Data
- Appendix H – Remaining Life Data
- Appendix I – PCN/ACN Data
- Appendix J – Airfield CIP Maps and Data
- Appendix K – Maintenance Plan and Summary

Lastly, a copy of the MicroPAVER pavement management database will be provided to the Airport for future needs.

1.6 REFERENCES

The following documents/publications were utilized during the development of this PMP report:

- ASTM D5340-12 “Standard Test Method for Airport Pavement Condition Index Surveys”
- FAA Advisory Circular 150/5380-7B “Airport Pavement Management Program”
- FAA Advisory Circular 150/5380-6C “Guidelines and Procedures for Maintenance of Airport Pavements”
- FAA Advisory Circular 150/5320-6F “Airport Pavement Design and Evaluation”

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

CHAPTER 2: SYSTEMS INVENTORY AND NETWORK DEFINITION UPDATE

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

CHAPTER 2 – SYSTEMS INVENTORY AND NETWORK DEFINITION UPDATE

2.1 OVERVIEW

To complete the pavement evaluations and to develop a pavement management program, it is necessary to collect information related to the existing pavement's structure, condition and boundaries. The information collected is then used to define the pavement network and is incorporated into pavement analysis software to estimate pavement deterioration rates and to determine rehabilitation needs. The approaches taken to collect the required information and define the pavement network are described in this chapter.

2.2 HISTORICAL RECORD RESEARCH

As part of the previous two APMS Update studies (2004,2016), a thorough records review was performed to determine the construction and rehabilitation history of the airside pavements at the Greenville-Spartanburg International Airport. During the initial APMS Update in 2004, the Airport provided access to historical records dating back to 1962, which included as-built drawings, plans, previous pavement evaluation reports, geotechnical reports, and master plan reports. The information of interest for the pavement management implementation includes the existing pavement thickness and composition, construction dates, soil classifications, traffic forecast, and maintenance history. During the 2016 update, the consultant worked with the Airport to collect information for all construction and rehabilitation projects in the previous years.

For the 2017 update, AVCON coordinated with Airport personnel to further update the pavement inventory and rehabilitation history for all projects completed since 2016. All data collected was reviewed and the construction history of the various pavement elements on the Airport was updated. This information is summarized in the "Pavement Construction History" table for the airside pavement sections in **Appendix B**, and all pavement sections subject to construction since the 2016 APMS update are listed below in **Table 2.1**. The chronological construction history data was also input and stored in GSP's MicroPAVER database. The complete Work History Report generated from MicroPAVER is included as **Appendix C**. This report includes the following items for each section: surface type, dates of construction or last construction event, section boundaries, and section areas.

Year	Construction Event	Pavement Sections
2016	New PCC Construction	TL01-25
		TWL2-30
2016	AC Overlay	TWG-20
2017	PCC Reconstruction	ATERM-10
		ATERM-20
		ATERM-30

Table 2.1 – Construction Events Since 2016

2.3 NETWORK DEFINITION

One of the primary purposes of the systems inventory is to plan for the pavement condition surveys (the methodology is explained in the following chapter). To perform the condition surveys and other data collection activities, the pavements are first separated into management units, which help to organize the data collection effort in a logical manner. Such divisions also help later in the analysis of the collected data and in communicating the project's findings.

The establishment of divisions or management units consists of creating an organizational hierarchy of all pavements. The highest level of a pavement inventory is the *network,* which consists of the entirety of the airfield pavement. The *branch* or *facility* is the sublevel to the *network*. In the Airport setting, facilities consist of distinct runways, taxiways, aprons, and any other pavement grouping that can be defined by a change in usage. Facilities are further divided into *sections*. Sections are parts of the facility that share common attributes, such as the cross section, traffic level, and performance. As an example, for a runway, the keel (center) portion is usually defined as one section while the outer portions of the runway constitute two additional sections. This reflects the fact that even if the cross section of the runway is the same throughout, its performance is likely to be different in the keel due to more frequent traffic loading. The third subdivision or level is called a *sample unit*. Sections are divided into sample units according to well-defined rules based on surface type. For example, on airfield pavements, a sample unit is 5,000 ± 2,000 square feet for asphalt concrete (AC) pavement and 20 ± 8 slabs for portland cement concrete (PCC) pavement. Sample units are randomly selected for inspection to obtain representative conditions for each pavement section. Additional sample units were inspected in the field where unique or unrepresented distresses were observed in order to more accurately calculate the PCI.

For the most part, the breakdown of the pavements established during the 2004 and 2016 studies was used for the 2017 update. However, those pavement sections constructed or rehabilitated since 2016 were either added to the Network Definition or modified accordingly (see **Table 2.1** for a list of projects). The breakdown was verified in the field as part of the pavement inspection and changes were made as needed. It should be noted that there were significant variations to the rehabilitation for the Airside Terminal Apron, which in turn led to high variability in the pavement sections. As a result, extensive effort was required to update this area of the network.

To complete this APMS Update, a total of 97 Sections were evaluated through the inspection of approximately 400 field-surveyed sample units.

For convenience, each section is labeled using commonly followed conventions that identify the section by usage and sequence. For example, all runway sections begin with "RW" followed by the runway number designation (e.g., Runway 04-22 is labeled RW04). Likewise, taxiways begin with "TW," aprons begin with "A," shoulders begin with "SH," and blast pads begin with "BP."

Section numbering typically begins with "10" and proceeds in increments of 10 along the length of the facility. This is done to allow new sections to be easily added for future surveys. Thus, sections on Runway 04-22 are designated RW04-10 (Section 10), RW04-20 (Section 20), RW04-30 (Section 30), and so on. A Network Definition Map illustrating all branches, sections, and sample units is presented in **Appendix A**. The sample units inspected during this project are also identified on the Map.

Table 2.2 presents the pavement area and the percentage of pavement area by branch use (runway, taxiway, apron, shoulder, and blast pad). **Figure 2.1** graphically illustrates this information. Overall, the airside pavement network at GSP comprises approximately 7.9 million square feet of pavement. **Table 2.3** and **Figure 2.2** show the pavement areas by surface type, which are defined as follows:

- PCC – Portland cement concrete pavement;
- AC – Asphalt concrete pavement.

Most of the existing pavement network at GSP is constructed with PCC pavement (52% of the area). These sections include Airside Terminal Aprons A and B (Section 10, 20 and 30); North and South Cargo Apron; General Aviation Apron; and both south end and north end of Runway 04-22; as well as Taxiway A, B, C, J, K, most of Taxiway L, and Taxilane L01 and L02. Some sections of Taxiway L2, L3, and L5 are PCC pavement as well. The middle section of Runway 04-22; 6000 ft long, as well as the remaining sections in the network are composed of AC pavement. For the purpose of this evaluation, AC pavements include AC pavements that have been overlaid with asphalt. A final pavement surface type is PCC that has been overlaid with asphalt; however, this surface type is not present at GSP.

Branch Use	Area (SF)	Percent of Total Area
Runways	1,650,000	21%
Taxiways	2,228,411	28%
Aprons	2,286,419	29%
Shoulders	1,528,619	19%
Blast Pads	176,000	2%
Total	**7,869,449**	**100%**

Table 2.2 – Airfield Pavement Area by Branch Use

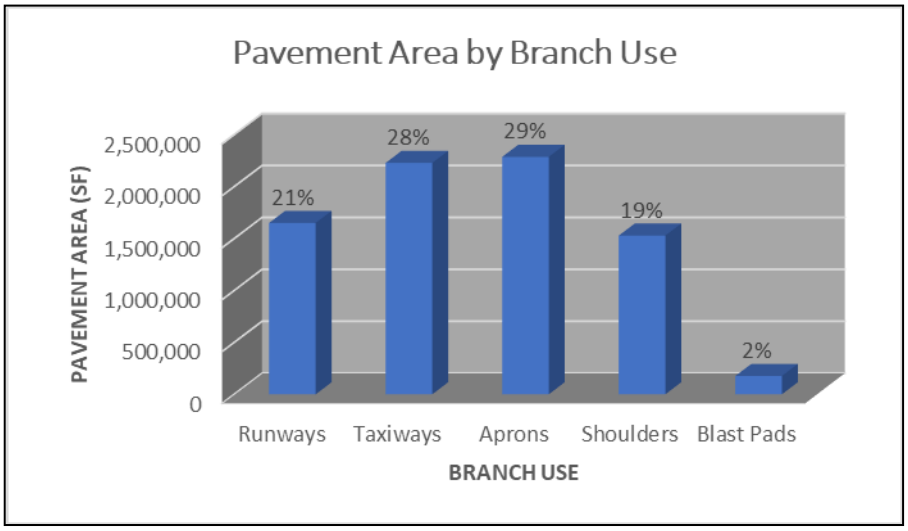


Figure 2.1 – Airfield Pavement Functional Classification Use by Area

Surface Type	Area (SF)	Percent of Total Area
PCC	4,103,122	52%
AC	3,766,327	48%
Total	**7,869,449**	**100%**

Table 2.3 – Airfield Pavement Area by Surface Type

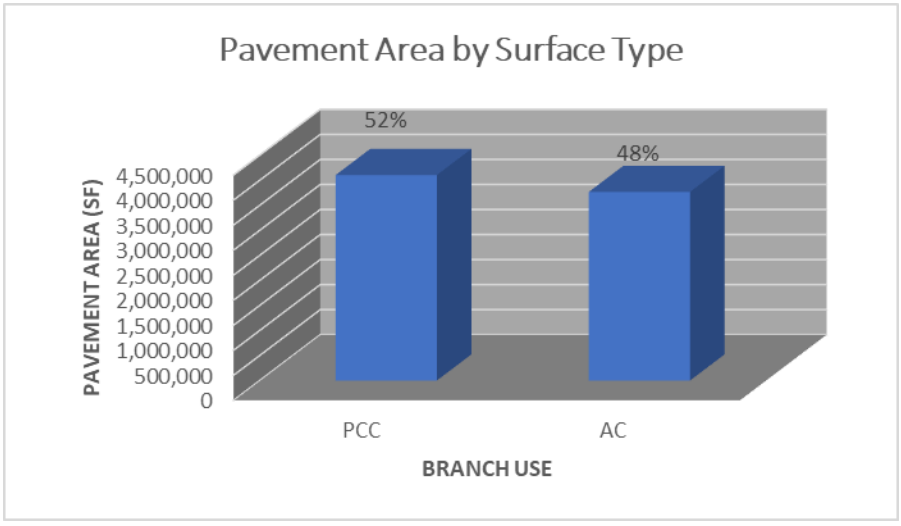


Figure 2.2 – Airfield Pavement Area vs. Surface Type

2.4 SUMMARY

At the beginning of this project, the project team worked with the Airport to conduct a thorough records review of all pavement sections that were constructed or rehabilitated since the previous Pavement Management Update in 2004 and the Pavement Condition Index Update in 2016. The review included information contained in as-built record drawings, plans, and various reports. The information obtained during this data collection effort was added to MicroPaver for further analysis. The network definition map for GSP was also updated and used as the basis for performing the pavement condition surveys, the results of which are presented in **Chapter 3**.

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

CHAPTER 3: PAVEMENT CONDITION SURVEYS

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

CHAPTER 3 – PAVEMENT CONDITION SURVEYS

3.1 OVERVIEW

This chapter summarizes the results of the pavement condition surveys performed on the airfield pavements at GSP in June 2017. Distress data from the inspections was entered into the MicroPAVER database to calculate the PCI values. These inspections were performed in accordance with the Pavement Condition Index (PCI) methodology, as documented in the following publications:

1. The U.S. Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements*.
2. The American Society for Testing and Material (ASTM) Standard D5340, *Standard Test Method for Airport Pavement Condition Index Surveys*.

3.2 PAVEMENT CONDITION INDEX (PCI) SURVEY METHODOLOGY

The PCI procedure is an objective ranking process whereby a pavement is given a numerical score based on the type, severity level, and quantity of each distress present. The PCI ranges from 0 (a failed pavement) to 100 (a pavement with no visible signs of deterioration). To evaluate the PCI for a given sample unit, each distress type observed is assigned a deduct value based on its frequency of occurrence (distress density) within that sample area and its severity. All deducts are summed and subsequently adjusted for the number of different distresses found. This corrected deduct value is subtracted from 100 to arrive at the PCI for that particular sample unit. The PCI for a pavement section is the mean PCI value of all sample units evaluated in that section.

In general terms, pavements with a PCI of more than 71 – that are not exhibiting significant load-related distress – will benefit from global preventative maintenance actions, such as joint sealing or surface treatments; and from localized preventative actions, such as crack sealing. Pavements with a PCI of 41 to 70 may require major rehabilitation, such as an overlay or partial slab repairs. Often, when a pavement has a PCI of less than 41, reconstruction is the only viable alternative due to the substantial damage to the pavement's functional integrity. **Figure 3.1** illustrates how the type of appropriate repair varies with the PCI of a pavement section. The repair recommendations, however, will vary depending on customizations made for pavement use and priority. The cost and timeframes associated with the repairs are discussed in Chapter 6. The scale and repair types shown in **Figure 3.1** have been customized for the District to better meet the needs of GSP.

PCI		Classification	Repair Type
91-100		Excellent	Preventative Maintenance
81-90		Very Good	
71-80		Good	
61-70		Fair	Major Rehabilitation
51-60		Poor	
41-50		Very Poor	
0-40		Failed	Reconstruction

Figure 3.1 – Typical PCI Scale and Repair Type

PCI survey results are only an indirect indicator of the overall condition of the pavement because only the surface layer of a multi-layered pavement is examined. However, by examining the types of distress on a section of pavement and where its PCI rating falls on a qualitative scale, additional insight about the pavement's performance is obtained. Although PCI ratings can be used as a general guideline for identifying the repair type, examining the individual distresses measured during the survey is often more useful in assessing the cause(s) of deterioration.

The PCI may also be evaluated in terms of the percent of deducts (from a perfect score of 100) that are due to load-related distresses (defined as those distresses caused by traffic loading) and those that are due to climate and other distresses. For example, consider a pavement section that has a PCI of 60 (i.e., 40 deduct points). If 20 of those deduct points are due to load, then 50 percent of the deduct points are due to load, suggesting that traffic loading is strongly affecting the performance of the pavement.

The loss in PCI over time (i.e., the pavement's rate of deterioration) is another factor that is of interest in evaluating the performance of a pavement surface. Pavements that are exhibiting high deterioration rates should be monitored more closely.

While the PCI results give a general indication of the overall condition of the pavement, the specific maintenance or rehabilitation needs of a pavement are often obscured by such an index. In addition to reporting the PCI survey results, the survey crew also identified the specific distresses that were present, reported on the possible causes of such distresses, and related such findings to general categories of treatment. Furthermore, detailed notes were taken regarding items of importance that are not part of a typical PCI survey. During the condition surveys, the survey crews also took photographs of distresses observed on the pavement, both to record typical conditions and to highlight areas of concern.

3.3 DISTRESS TYPES

For AC-surfaced airfield pavements, there are seventeen possible distress types included in the PCI procedure, and nine of these distresses were identified during the inspections at GSP. For PCC-surfaced airfield pavements, there are sixteen identifiable distress types, and ten of these distresses were identified at GSP.

The PCI procedure separates distresses into three categories based on the expected cause of the distress. By knowing the cause(s) of the pavement deterioration, appropriate repair and rehabilitation alternatives can be identified. The three categories for distress types are load-related distresses (such as alligator cracking and rutting on AC pavements and linear cracking on PCC pavements), climate-related distresses (such as block cracking and weathering on AC pavements and durability cracking on PCC pavements), and other distresses (which include man-made distresses (such as patches and utility cuts). Load-related distresses are defined as being caused by aircraft or vehicular traffic and may provide an indication of a structural deficiency. Climate-related distresses often signify the presence of aged and/or environmentally susceptible material and include durability-related issues.

The distress types observed throughout the pavements at GSP and their related causes are presented in **Table 3.1**. There are other types of pavement distresses; however, they are not listed in **Table 3.1** because they were not observed during the current Update. They include shoving, corrugation, and polished aggregate in AC pavements and blow-ups, alkali silica reaction, and durability cracking in PCC pavements.

AC Pavement Distress	Related Cause
Bleeding	Other: Mix/Materials/Construction
Block Cracking	Environment
Longitudinal & Transverse Cracking (L&T)	Environment/Construction
Oil Spillage	Other: Oil/fuel spill
Patching and Utility Cut Patch	Other: Repair
Rutting	Load
Slippage Cracking	Other: Mix/Materials/Load
Swelling	Environment
Weathering	Environment

PCC Pavement Distress	Related Cause
Corner Break	Load
Longitudinal, Transverse & Diagonal Cracking (LTD)	Load
Joint Seal Damage	Environment
Patching, Small	Other – Repair
Patching, Large	Other – Repair
Scaling	Environment/Construction/Materials
Shattered Slab	Load
Shrinkage Cracks	Other – Construction
Spalling (Joint)	Load/Construction
Spalling (Corner)	Load/Construction

Table 3.1 – Summary of Distresses Observed at Greenville-Spartanburg International Airport

Appendix F presents an in-depth discussion of each of these distresses, including photographs of the distresses, taken during the PCI inspection.

3.4 PCI SURVEY RESULTS

A detailed discussion regarding the overall pavement conditions and distresses present for each pavement facility is included in this section of the report. **Table 3.2** lists all of the pavement sections inspected at GSP that are subject to aircraft loadings and their respective PCI values. The PCI results for each specific pavement section are discussed later in this chapter.

Overall, the airside pavements at GSP have an area-weighted PCI value of 81 indicating that the majority of the pavement system is in very good condition. **Figure 3.2** and **Figure 3.3** provide an overview of the PCI results distributed by surface type and by branch use, respectively.

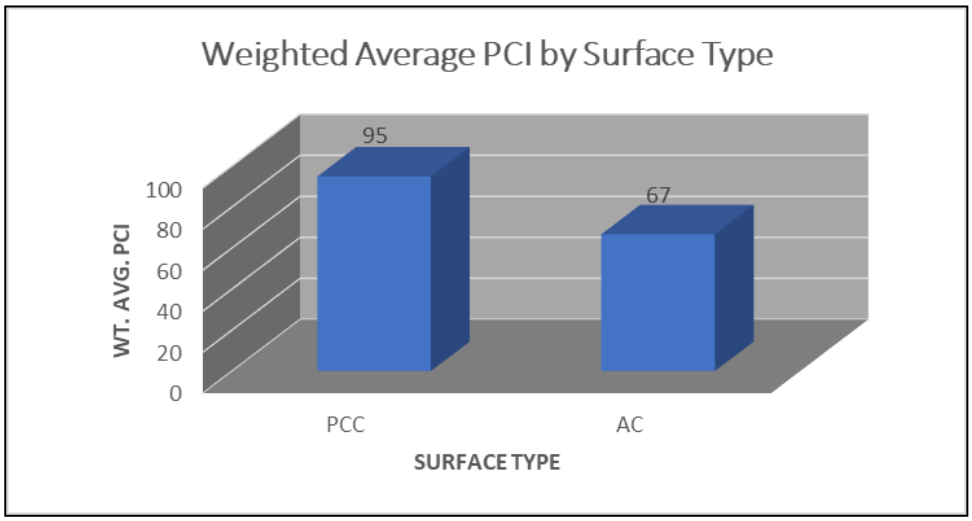


Figure 3.2 – Summary of PCI Results by Surface Type

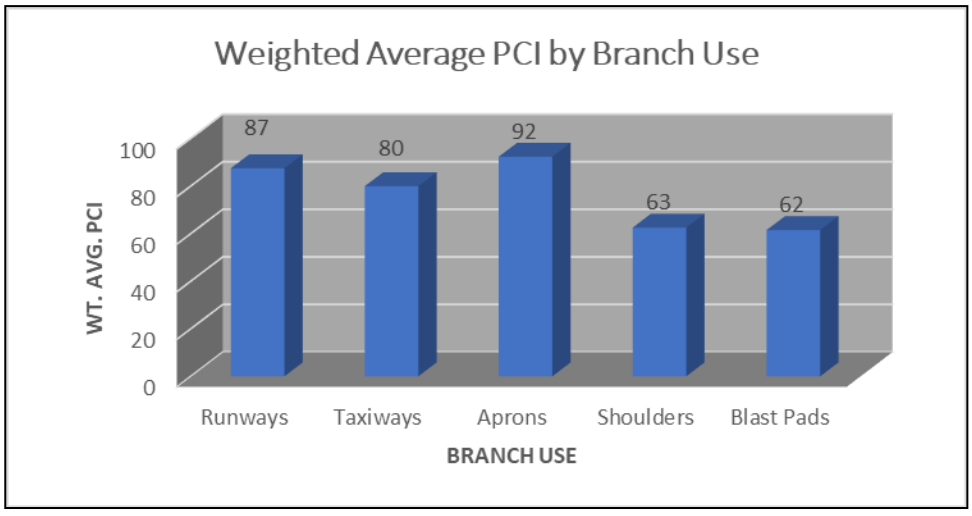


Figure 3.3 – Summary of PCI Results by Branch Use

A pavement condition map showing the PCI of each individual section is presented in **Figure 3.4** (see full size map in **Appendix E**).

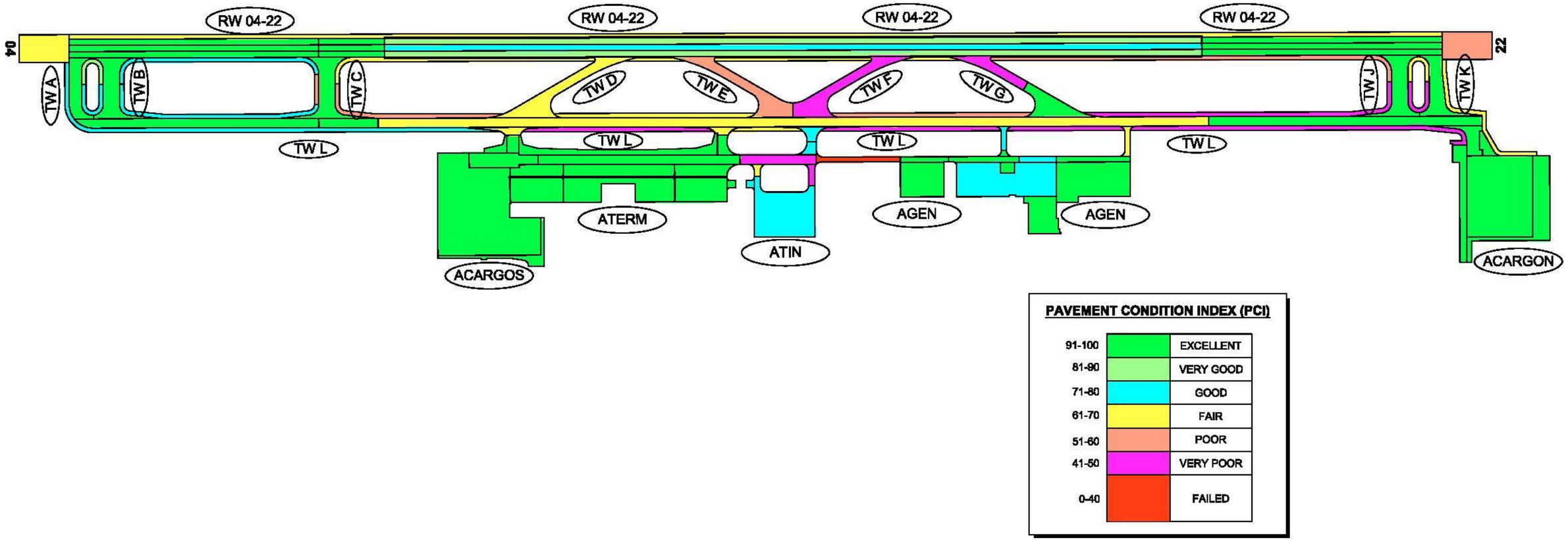


Figure 3.4 – Pavement Condition Index (PCI) Rating Map – 2017

Runway 04-22

Runway 04-22 handles all the aircraft traffic at the Airport. The runway consists of three segments, both the southern end and north end are PCC, while the middle portion is AC. The runway consists of 12 sections total with nine PCC sections and three AC sections.

Runway 04-22 was originally constructed with both asphalt and concrete portions in 1962 and was strengthened in 1977 to accommodate larger aircraft. In 1995, the runway was extended again from 7,600 ft to 9,000 ft as the Airport's name was changed to Greenville-Spartanburg International Airport. By 1999, the second runway expansion project was completed, extending the runway to 11,001 ft. Beginning in 2008 the runway was rehabilitated with a 2-inch overlay on the 6,000ft asphalt portion of the runway. A summary of the condition of each section is listed in **Table 3.3**.

Runway 04-22 has an area weighted PCI of 87 which reflects the work the Airport has done to maintain the runway in good condition.

Section	PCI	Surface Type
RW04-10	100	PCC
RW04-20	99	PCC
RW04-30	100	PCC
RW04-40	97	PCC
RW04-50	100	PCC
RW04-60	97	PCC
RW04-70	84	AC
RW04-80	75	AC
RW04-90	81	AC
RW04-100	98	PCC
RW04-110	99	PCC
RW04-120	95	PCC
PCC Area - Weighted PCI	**98**	
AC Area - Weighted PCI	**80**	
Section PCI Range	**(75-100)**	

Table 3.3 – Runway 04-22 PCI Summary

The landing area of RW04 is in excellent condition. Sections 10, 20, and 30 are PCC pavements and have little to no distresses. These sections have 100, 99, and 100 PCI respectively. Sections 40 and 60 contained minimal distresses while section 50 was in very good condition. These sections had PCI values of 97, 97, and 100, respectively.

Along the northern end, Sections 100, 110, and 120 showed more distresses than the southern end. Although still in great condition, these sections showed lower PCI than the other PCC sections, having a 98, 99, and 95 PCI, respectively. The primary distresses on these PCC runway sections include shrinkage, spalling, and small patches.

Small Patch

Shrinkage Crack

For this update, Section 70, 80 and 90 were duplicated using the data from 2016 report due to limited access to the runway during the inspection period. The AC pavements experienced more distresses than the PCC pavement portions. Sections 70, 80 and 90 consist of an 84, 75, and 81 PCI, respectively. Throughout the runway, the following distresses were observed: weathering, swelling, linear cracks and patching, all of which were low-severity for the AC pavement portions.

Swelling

Small Patch

Taxiway A, B and C

Located at the southern end of the runway, Taxiways A, B, and C were added as part of the runway extension project in 1999; connecting Runway 04-22 to Taxiway L. Sections TWA-10, TWB-10, and TWC-10 all have little to no distresses, having a 99, 99, and 98 PCI, respectively. The most predominant distress in these sections is joint spalling. Other distresses found in these sections are small patches, corner spalls, and some joint seal damage. The PCI results for these sections are summarize in **Table 3.4**.

Section	PCI	Surface Type
TWA-10	99	PCC
TWB-10	99	PCC
TWC-10	98	PCC
Area - Weighted PCI	**99**	
Section PCI Range	**(98-99)**	

Table 3.4 – Taxiway A, B and C PCI Summary

Taxiway D, E, F and G

Rehabilitated in 1994, both Taxiway D and F are high-speed south bound exits connecting Runway 04-22 and Taxiway L. Taxiway E and G were also rehabilitated in 1994 and are high-speed north bound exits connecting Runway 04-22 and Taxiway L. Sections TWD-10, TWE-10, TWF-10, and TWG-10 all show extensive swelling throughout the pavement as well as weathering. Longitudinal and transverse (L&T) cracks of low and medium severity were also observed in these sections. TWG-10 also shows rutting beyond the holding position marking. TWG-20, rehabilitated in 2016, showed no signs of distresses. A summary of the condition of each section is listed in **Table 3.5**.

Section	PCI	Surface Type
TWD-10	68	AC
TWE-10	58	AC
TWF-10	49	AC
TWG-10	44	AC
TWG-20	100	AC
Area - Weighted PCI	**63**	
Section PCI Range	**(44-100)**	

Table 3.5 – Taxiway D, E, F, and G PCI Summary

L&T Crack, Weathering and Swelling

L&T Crack

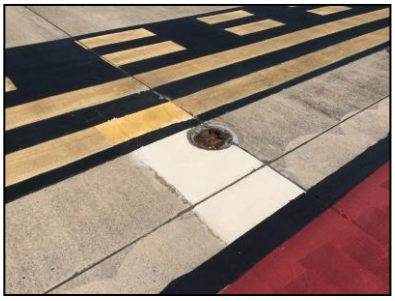
L&T Crack, Weathering, Swelling and Rutting

Taxiway J and K

Located at the northern end of the runway, Taxiways J and K were originally constructed in 1996; connecting Runway 04-22 to Taxiway L. Sections TWJ-10 and TWK-10 show little to no distresses, having a 98 and 99 PCI, respectively. Shrinkage cracking and linear cracks, as well as small patches were found in these sections. A summary of the condition of each section is listed in **Table 3.6**.

Section	PCI	Surface Type
TWJ-10	98	PCC
TWK-10	99	PCC
Area - Weighted PCI	**98**	
Section PCI Range	**(98-99)**	

Table 3.6 – Taxiway J and K PCI Summary



Small Patch

Linear Crack

Taxiway L

Taxiway L is parallel to Runway 04-22. PCC Section TWL-10, constructed in 1999 as part of the runway extension project, is performing well, showing minor distresses such as shrinkage cracks, small patches and low-severity linear cracks. TWL-20 was reconstructed in 1996 and shows no signs of distresses. TWL-30 is the only AC pavement portion of Taxiway L; it shows extensive swelling and weathering throughout the whole section as well as some patching and low and medium severity L&T cracking. PCC Section TWL-40, constructed in 1996, is in good condition; showing some patches as well as joint spall and corner spall. The PCI results for all individual TW L sections are summarized in **Table 3.7**.

Section	PCI	Surface Type
TWL-10	96	PCC
TWL-20	100	PCC
TWL-30	61	AC
TWL-40	98	PCC
PCC Area - Weighted PCI	**97**	
AC Area - Weighted PCI	**61**	
Section PCI Range	**(61-100)**	

Table 3.7 – Taxiway L PCI Summary

L&T Crack

L&T Crack and Swelling

Linear Crack

Taxiway L2 and L3

Taxiways L2 and L3 connect Taxiway L to Air Cargo South Apron and Airside Terminal Apron, respectively. Taxiway L2 consists of three pavement sections, one AC-surface pavement and two PCC-surface pavements. Taxiway L3 consists of two sections, one AC-surface pavement and one PCC-surface pavement. AC Sections TWL2-10 and TWL3-10 exhibit extensive weathering as well as swelling and both low- and medium severity L&T cracks. PCC Sections TWL2-20, TWL2-30, and TWL3-20 each experience little to no distress, showing signs of shrinkage cracks, joint spalling and corner spalling. The PCI results for these sections are summarized in **Table 3.8**.

Section	PCI	Surface Type
TWL2-10	70	AC
TWL2-20	94	PCC
TWL2-30	98	PCC
TWL3-10	69	AC
TWL3-20	95	PCC
PCC Area - Weighted PCI	**95**	
AC Area - Weighted PCI	**70**	
Section PCI Range	**(69-98)**	

Table 3.8 – Taxiway L2 AND L3 PCI Summary

Taxiway L4, L5, and L6

Taxiway L4, composed of two AC-surface sections, connects Taxiway L to the Itinerant Apron. Taxiways L5 and L6 connect Taxiway L to the General Aviation Apron. Taxiway L5 consists of one AC-surface section (TWL5-10) and one PCC-surface section (TWL5-20), while Taxiway L6 is one AC-surface section (TWL6-10). AC Sections TWL4-10, TWL4-20, TWL5-10, and TWL6-10 all show extensive weathering, as well as swelling and L&T cracks. PCC Section TWL5-20 was reconstructed in 2015 and shows no signs of distress. A summary of the condition of each section is listed in **Table 3.9**.

Section	PCI	Surface Type
TWL4-10	75	AC
TWL4-20	71	AC
TWL5-10	76	AC
TWL5-10	100	PCC
TWL6-10	62	AC
PCC Area - Weighted PCI	**100**	
AC Area – Weighted PCI	**71**	
Section PCI Range	**(62-100)**	

Table 3.9 – Taxiway L4, L5 and L6 PCI Summary

Taxilanes L1 and L2

Taxilanes L1 and L2 run parallel to Taxiway L and are made up of mostly PCC-surface pavement sections, having only one AC-surface pavement section each. Taxilane L1 connects the South Cargo Apron, the Air Carrier Terminal Apron and the Itinerant Apron. PCC Sections TL01-10, TL01-20, and TL01-25 are in good condition with the occasional shrinkage cracking, joint spalls, and corner spalls. AC Section TL01-30, shows extensive weathering as well as swelling throughout the section. In addition, low, medium and high severity L&T cracks exist in a large portion of the section.

Taxilane L2 connects the Itinerant Apron to General Aviation Apron. AC Section TL02-05 shows extensive swelling as well as weathering throughout the section. In addition, block cracking of low, medium, and high severity is prevalent in this section. PCC Sections TL02-10, TL02-15 and TL02-30 are in good condition, with only few instances of shrinkage cracks, joint spalls and corner spalls. PCC Section TL02-20 shows additional distresses such as low- and medium-severity corner breaks, in addition to linear cracks, small patches, shrinkage cracks, joint spalls, and corner spalls. The PCI results for all these sections are summarized in **Table 3.10**.

L&T Crack

Linear Crack

L&T Crack and Swelling

L&T Crack and Swelling

Section	PCI	Surface Type
TL01-10	97	PCC
TL01-20	97	PCC
TL01-25	96	PCC
TL01-30	48	AC
TL02-05	33	AC
TL02-10	95	PCC
TL02-15	98	PCC
TL02-20	77	PCC
TL02-30	99	PCC
PCC Area - Weighted PCI	**96**	
AC Area - Weighted PCI	**42**	
Section PCI Range	**(33-99)**	

Table 3.10 – Taxilane L1 and L2 PCI Summary

Air Carrier Terminal Apron

Originally constructed in 1962, the Air Carrier Terminal Apron was under construction, in its third and final phase of reconstruction at the time of completion of the PCI analysis. Due to this project, as the reconstruction project did not include the entire ramp, the single section that was used to represent the ramp condition was broken into three different sections to reflect the condition of different areas of the ramp. Sections ATERM-10 and ATERM-20 exhibit little to no distress, exhibiting only few patch, joint spall and corner spall. Section ATERM-30 was not inspected in this update as it was in the midst of rehabilitation. However, it was assumed in this study that upon completion of construction, this section would have a PCI value of 100. A summary of the section condition is provided in **Table 3.11**.

Section	PCI	Surface Type
ATERM-10	100	PCC
ATERM-20	99	PCC
ATERM-30	100	PCC
Area - Weighted PCI	**100**	
Section PCI Range	**(99-100)**	

Table 3.11 – Air Carrier Terminal Apron PCI Summary

South Air Cargo Apron

The South Air Cargo Apron was last reconstructed in 2002. It consists of two PCC-surface pavement sections; ACARGOS-10 and ACARGOS-20, which are in good condition. Shrinkage cracking and joint spalls are the two most prevailing distresses in these sections; however, small patches and corner spalls are also present in small numbers. A summary of the section condition is presented in **Table 3.12**.

Section	PCI	Surface Type
ACARGOS-10	93	PCC
ACARGOS-20	99	PCC
Area - Weighted PCI	**93**	
Section PCI Range	**(93-99)**	

Table 3.12 –South Air Cargo Apron PCI Summary

Joint Spall

North Air Cargo Apron

Originally constructed in 1996, the North Air Cargo Apron consists of three PCC-surface pavement sections. Although all three sections are in good condition, section ACARGON-10 has the most distresses; showing signs of low and medium severity joint spalls as well as corner spalls. In addition to those distresses, small and large patches were also found in this section. Sections ACARGON-20 and ACARGON-30 show little to no signs of distress for the most part, only few occurrences of joint spalls, joint seal damage, shrinkage cracking and small and large patches were observed in these sections, reducing slightly their excellent PCI value. A summary of the section condition is provided in **Table 3.13**.

Section	PCI	Surface Type
ACARGON-10	92	PCC
ACARGON-20	97	PCC
ACARGON-30	96	PCC
TWCARGO-10	92	PCC
TWCARGO-20	94	PCC
Area - Weighted PCI	**94**	
Section PCI Range	**(92-97)**	

Table 3.13 – North Air Cargo Apron PCI Summary

Shrinkage Crack

Corner Break

Small Patch

Itinerant Apron

The Itinerant Apron originally constructed in 1962 consists of three sections: two AC-surface pavement sections and one PCC-surface pavement section. AC Sections AITIN-10 and AITIN-20 connect Taxilane L1 to section AITIN-30. Sections AITIN-10 and AITIN-20 show extensive swelling and weathering, as well as L&T cracks of both low and medium severity. PCC Section AITIN-30, shows extensive amount of distresses. Distresses found in these sections are corner break, linear cracks, small and large patches, scaling, shattered slabs, shrinkage cracks, joint spalls, and corner spalls. A summary of the section condition is listed in **Table 3.14.**

Section	PCI	Surface Type
AITIN-10	63	AC
AITIN-20	46	AC
AITIN-30	73	PCC
PCC Area - Weighted PCI	**73**	
AC Area - Weighted PCI	**53**	
Section PCI Range	**(46-73)**	

Table 3.14 – Itinerant Apron PCI Summary

Corner Break
and Small Patch

Shattered Slab

Linear Crack, Joint
Spall and Corner Spall

General Aviation Apron

The General Aviation Apron consists of five PCC-surface pavement sections. Sections AGEN-10 and AGEN-30 showed little to no distress, exhibiting only one instance of shrinkage crack and two small joint spalls. Section AGEN-20 experienced more distresses than the other sections; with corner breaks, low, medium, and high severity linear cracks, small and large patches, scaling, shrinkage cracks, joint spalls and corner spalls. Section AGEN-40 shows very minimal distress with only joint seal damage, small patches, shrinkage cracks, joint and corner spalls. Section AGEN-50 was reconstructed in 2015 and exhibits shrinkage cracks and a high-severity corner spall. A summary of the section condition is listed in **Table 3.15.**

Section	PCI	Surface Type
AGEN-10	100	PCC
AGEN-20	79	PCC
AGEN-30	100	PCC
AGEN-40	96	PCC
AGEN-50	97	PCC
Area - Weighted PCI	**92**	
Section PCI Range	**(79-100)**	

Table 3.15 – General Aviation Apron PCI Summary

Corner Break

Small Patch

Linear Crack

Small Patch

Corner Break

Shrinkage Crack

Fire Station Ramp 1 and 2

The Fire Station Ramp consist of two PCC-surface pavement sections. FS-10 faces the Air Carrier Terminal Apron whereas FS-20 faces the Itinerant Apron. Section FS-10 show minimal distresses; showing small patches and shrinkage cracks only. Section FS-20 exhibited corner breaks, linear cracks, and small patch distresses. A summary of the section condition is listed in **Table 3.16.**

Section	PCI	Surface Type
FS-10	92	PCC
FS-20	72	PCC
Area - Weighted PCI	**82**	
Section PCI Range	**(72-92)**	

Table 3.16 – Fire Station Ramp 1 and 2 PCI Summary

Corner Spall

Corner Break, Corner Spall and Small Patch

Blast Pads

Two blast pad pavement sections are defined on the airfield. AC Section BP-04 shows an extensive amount of distress such as low and medium severity L&T cracks, swelling, and medium severity weathering. AC Section BP-22 experienced more deterioration than Section BP-04; the distresses experienced in this section are bleeding, low, medium, and high severity L&T cracks, oil spills, swelling and weathering. A summary of the section condition is represented in **Table 3.17.**

L&T Crack

L&T Crack and Swelling

Section	PCI	Surface Type
BP-04	69	AC
BP-22	54	AC
Area - Weighted PCI	**62**	
Section PCI Range	**(54-69)**	

Table 3.17 – Blast Pads PCI Summary

Shoulders

Thirty (30) AC-surface shoulder pavement sections are defined at GSP. These sections have an area-weighted PCI of 62. Approximately 10 percent of the sample units defined within the shoulder pavement sections were surveyed as part of the pavement management system in order to provide a general indication of their overall condition. Of the 30 sections, only eight sections have PCIs below the critical value of 55 defined for shoulder pavements. **Table 3.18** summarizes the PCI values.

Section	PCI	Surface Type	Section	PCI	Surface Type
SHRW04-10	63	AC	SHTWC-10	55	AC
SHRW04-15	81	AC	SHTWK-10	66	AC
SHRW04-20	89	AC	SHTWL-10	72	AC
SHRW04-30	78	AC	SHTWL-20	75	AC
SHRW04-40	67	AC	SHTWL-30	73	AC
SHRW04-45	81	AC	SHTWL-40	58	AC
SHRW04-50	70	AC	SHTWL-50	50	AC
SHRW04-55	83	AC	SHTWL-60	63	AC
SHRW04-60	70	AC	SHTWL-70	61	AC
SHRW04-65	81	AC	SHTWL-80	46	AC
SHRW04-70	70	AC	SHTWL-90	53	AC
SHRW04-75	83	AC	SHTWL-100	41	AC
SHRW04-80	53	AC	SHTWL-110	50	AC
SHRW04-85	81	AC	SHTWL-120	48	AC
SHRW04-90	65	AC	SHTWL-130	49	AC
RW Shoulder Area - Weighted PCI				**67**	
TW Shoulder Area - Weighted PCI				**58**	
Section PCI Range				**(41-89)**	

Table 3.18 – Shoulder Pavement Sections PCI Summary

L&T Crack

Block Crack, L&T Crack and Swelling

Block Crack and L&T Crack

3.6 SUMMARY

Upon approval from the Airport; due to limited access to the runway during the inspection period, the asphalt sections of the runway were duplicated using the data from the 2016 report. Sections RW04-70, RW04-80, and RW04-90 were analyzed by their PCI values as well as their distresses observed for that inspections period.

The remaining pavement sections at GSP were surveyed according to the PCI procedure; the results of which are summarized in this chapter of the report and in **Appendix D** through **Appendix F**. Overall, the pavement sections are in very good condition, with an average area-weighted PCI of 81 for the entire pavement network at GSP.

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

CHAPTER 4: REMAINING LIFE ANALYSIS

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

CHAPTER 4 – REMAINING LIFE ANALYSIS

4.1 OVERVIEW

Remaining life is defined as the amount of life (expressed in terms of time or traffic loadings) that a pavement section can withstand before it fails. Pavement failure can be defined in two ways: reaching a critical roughness level (functional remaining life) or developing a critical level of a key structural distress (structural remaining life). Whichever approach is used, the estimation of remaining pavement life is a useful function of a pavement management system. At the project level, remaining life estimates provide insight into both the surface condition and the structural capacity of the existing pavement and thereby indicate the need for major rehabilitation. At the network level, remaining life predictions of families of pavements facilitate planning, scheduling, and budgeting of future rehabilitation activities, thereby contributing to the most effective use of limited resources.

For this report, we have calculated remaining life using two methods. The first method to determine remaining life involves software developed by the Federal Aviation Administration (FAA) and is based on layered elastic and three-dimensional finite element-based structural analysis. This software analyzes the load-carrying capacity of the pavement and is used to calculate the structural remaining life by examining the existing pavement structure and the intended mix and frequency of aircraft traffic. The aircraft traffic data and assumptions used for the analysis are shown in **Appendix G** and are based on a particular pavement section's anticipated aircraft fleet mix.

The second method used to evaluate the remaining life of a pavement is through analysis of the pavement's current and projected PCI value. This method does not consider any structural properties of the pavement, but rather relies on visual examination of surface distresses to predict its future behavior. Further explanation of each method and their relative findings are discussed later in this chapter.

4.2 STRUCTURAL REMAINING LIFE IN FAARFIELD

The structural remaining life is determined through an analysis of the in-situ layer properties and projected traffic using the FAA's new airport pavement thickness design program, FAARFIELD 1.305 (FAA Rigid and Flexible Iterative Elastic Layered Design), provided in Advisory Circular (AC) 150/5320-6E, *Airport Pavement Design and Evaluation,* issued in September 2009. Layered elastic and three-dimensional finite element-based design theories were adopted to address the impact of new complex gear and wheel arrangements. The design method is computationally intense, so the FAA developed a computer program called FAARFIELD to help pavement engineers implement it. Prior to the creation and use of FAARFIELD, the "design aircraft" concept was used to calculate pavement design and remaining life by converting all airfield traffic into equivalent passes of the "most demanding aircraft." However, using FAARFIELD, the "design aircraft" concept has been replaced by design for fatigue failure expressed in terms of a cumulative damage factor (CDF). CDF is the amount of the structural

fatigue life of a pavement that has been used up. It is expressed as the ratio of applied load repetitions to allowable load repetitions to failure. The entire traffic mix is entered, along with the existing pavement structure (entering the layer properties determined by evaluation). The remaining life is calculated by applying the traffic volume (or years) until a CDF of 1.0 is achieved. **Table 4.1** shows the CDF value and its relationship to a pavement's remaining life.

CDF value	Pavement Remaining Life
1	The pavement has used up all of its fatigue life.
< 1	The pavement has some life remaining, and the value of CDF gives the fraction of the life used.
> 1	The pavement has exceeded its fatigue life.

Table 4.1 – Pavement Remaining Life Based on CDF Value

For PCC pavement, modulus of subgrade reaction (k-value), expressed in pounds per cubic inch (pci) is a critical input in determining the structural remaining life. For AC pavement sections, the subgrade modulus values expressed as a California Bearing Ratio (CBR) are used in FAARFIELD to determine the structural remaining life of a particular pavement. Many of these values were available from the Non-Destructive (ND) Heavy Weight Deflectometer (HWD) tests performed in August/September 2017. The estimated CBR values ranged from 3.0 to 41.6, while the back-calculated k-values ranged from 73.1 pci to 224.3 pci. Where this information was not available, CBR and k-values were estimated using data from the 2004 report "Pavement Evaluation and Development of a Pavement Management System for Greenville-Spartanburg International Airport – Final Report". This data, in conjunction with the Pavement Construction History Table in **Appendix B** and the Air Traffic Data for each pavement section as discussed in **Appendix G** and **Chapter 5**, form the inputs used in the structural remaining life analysis.

Figure 4.1 illustrates the pavement sections at GSP which are predicted to have less than 20 years structural remaining life based on CDF values; these sections will be considered further in the development of the CIP. **Table H.1** of **Appendix H**, Remaining Life Data, contains the remaining life in years for each pavement section as described above. It should be noted that several sections were not analyzed for this part of the report, including blast pads and shoulders. These sections are not subject to aircraft loads on a regular basis, therefore calculating remaining life using this approach would be inaccurate.

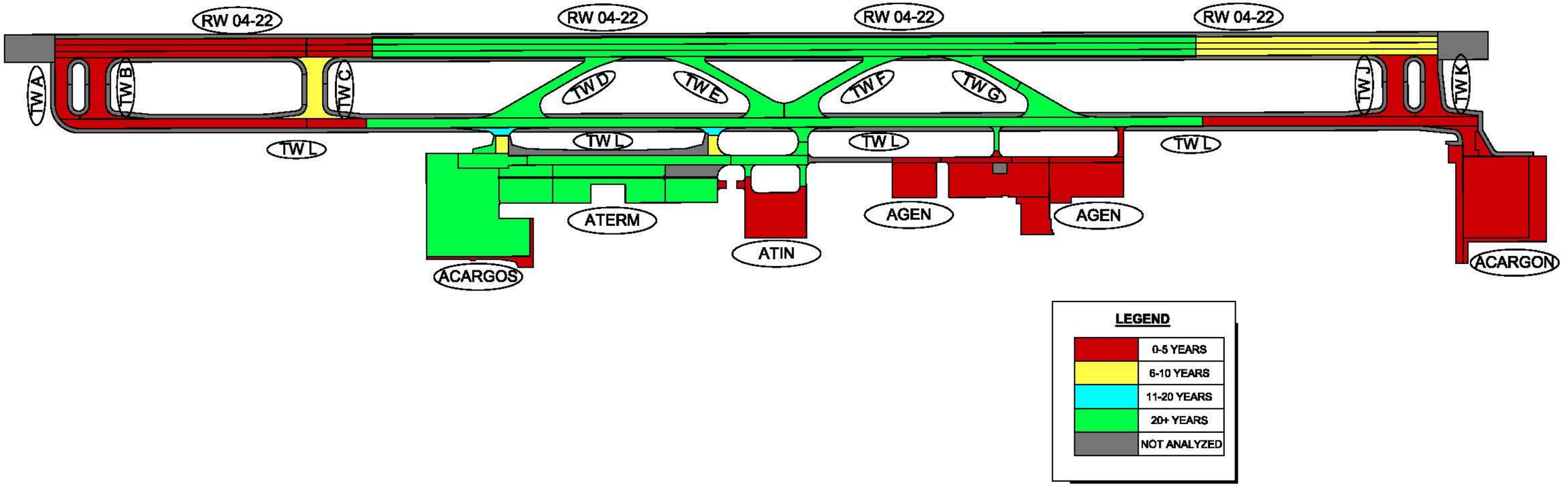


Figure 4.1 – Remaining Life – Structural Analysis in FAARFIELD

4.3 REMAINING LIFE BASED ON PCI

To determine the remaining life based on the PCI, the key input is the condition of the pavement as determined from the PCI surveys. Using the tools available through MicroPAVER, performance models are developed and used to estimate the time until the pavement reaches a critical PCI. Typically, performance models must be determined for each pavement family, or group of pavement sections with similar deterioration characteristics. A different pavement family is established for different combinations of Branch Use and Pavement Type. The performance models used in this report were determined from data collected in the 2017 PCI surveys as well as the historical behavior of the pavement as derived from the 2004 and 2016 PCI surveys at GSP. Due to changes in ASTM D5340 between inspection years, a degree of variability between different inspectors, and the lack of information between 2004 and 2016, a standard PCI deduction was introduced based on the pavement type and the age of the pavement, which is in line with industry standards. This deduction was applied to the PCI values generated in the 2017 inspection to determine approximate future PCI values and predict when the pavement will meet one of the cases below. **Table 4.2** displays the standard PCI deductions per year based on pavement type and age that was used for future PCI predictions.

	Pavement Age	
Pavement Type	**0-20 years**	**20+ years**
PCC	-1	-2
AAC	-2	-3

Table 4.2 – Standard PCI Deduction per Year

Figure 4.2 visually shows the pavement sections at GSP and their anticipated remaining life based on the two cases below. These sections will be considered further in the development of the CIP. **Table H.2** of **Appendix H**, Remaining Life Data, contains the remaining life in years for each pavement section and case as described above. The performance model prediction analysis was conducted for two cases:

- Case 1: The remaining life until major rehabilitation is recommended, which is set to the following critical PCI values:

Branch Use	PCI Value
Runway	70
Taxiway/Taxilane	65
Apron/Other	65

Table 4.3 – Critical PCI of Pavement Sections

- Case 2: The remaining life until the pavement is no longer serviceable, or functional remaining life, which is set to a PCI of 40 for all pavement facilities.

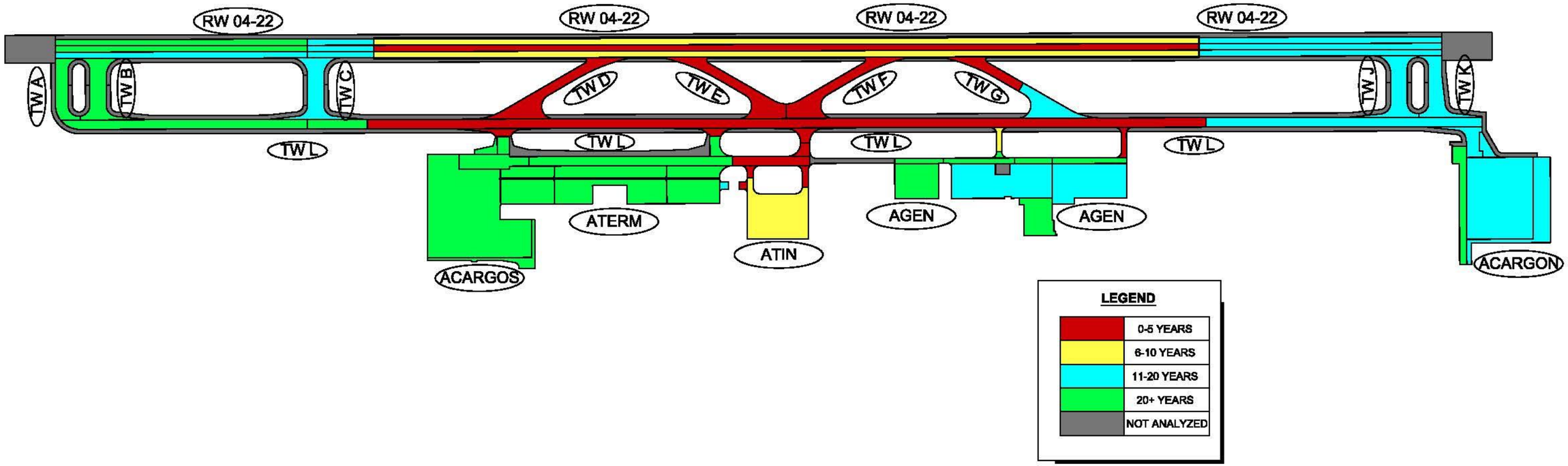


Figure 4.2 – Remaining Life to Critical PCI

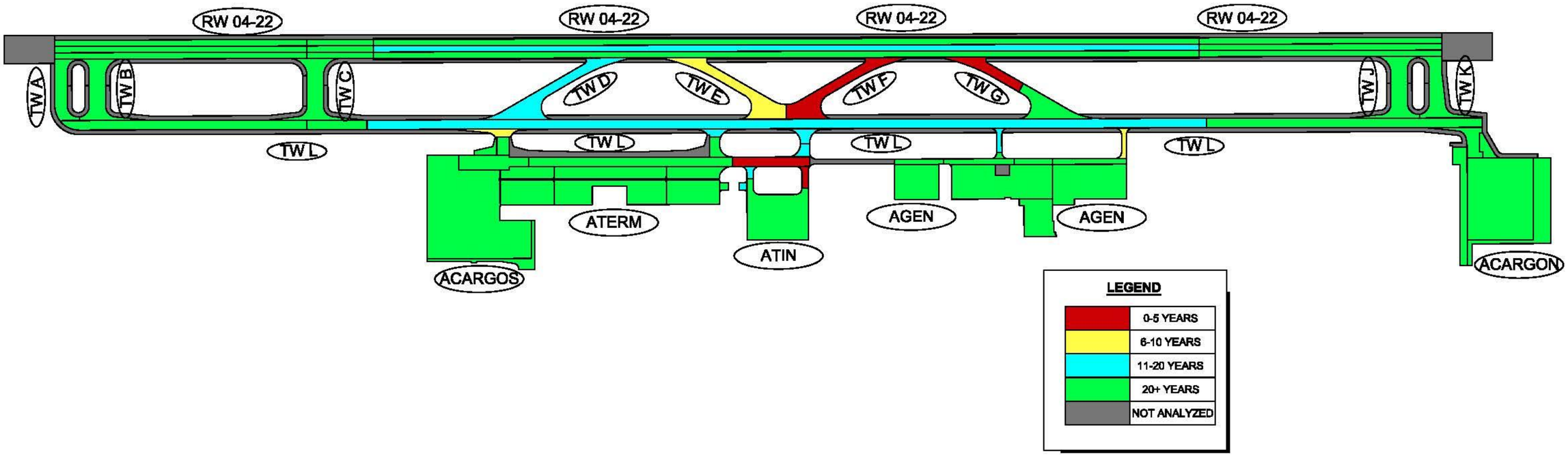


Figure 4.3 – Remaining Life to PCI = 40

4.4 REMAINING LIFE RESULTS

The remaining life results for all pavement sections, as determined both by structural analysis and PCI analysis, are summarized in **Appendix H**. The structural analysis for most sections is based on the material properties obtained from the 2017 HWD testing results as well as Record Drawings from past projects. Where Heavy Weight Deflectometer (HWD) testing was not conducted, subgrade strengths were estimated using data from "Pavement Evaluation and Development of a Pavement Management System for Greenville-Spartanburg International Airport – Final Report" from 2004.

Unlike the structural remaining life calculation, which evaluates the overall PCC pavement or AC pavement structure, the functional remaining life provides an evaluation of the most recent rehabilitation project as it only considers the existing pavement surface condition. Because the surface pavement condition has more of an immediate and direct impact on operations and safety, the functional remaining life is weighed more heavily in selecting projects for inclusion into the CIP.

Table H.1 in **Appendix H** represents a complete list of potentially problematic sections in terms of structural remaining life. However, it should be noted that zero or limited structural remaining life does not mean that the pavement is no longer functioning or that traffic should no longer use that pavement section. Although this type of analysis does not always precisely predict the pavement performance, it does provide a signal that further investigation into possible future problems is warranted. Examining multiple variables (such as structural remaining life, functional remaining life, PCN, back-calculation results, and required rehabilitation designs), the results can be collectively considered in the CIP development.

4.5 SUMMARY

The remaining life calculations provide an indication of the projected life of the pavement. Both the functional remaining life based on PCI and the structural remaining life based on load-carrying capacity were determined for the pavement sections at GSP. Overall, the analysis shows a wide variety of remaining life conditions, and some areas will require rehabilitation within the next few years. These results were used to assist in the development of the CIP, which is presented in **Chapter 6**.

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

CHAPTER 5: AIRCRAFT AND PAVEMENT CLASSIFICATION NUMBERS (ACN/PCN)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

CHAPTER 5 – AIRCRAFT AND PAVEMENT CLASSIFICATION NUMBERS (ACN/PCN)

5.1 OVERVIEW

The PCI values previously provided in this report are a representation of the pavement's surface condition based on its visual assessment. PCI determinations are not based on the historical construction and typical sections of the pavement and do not provide any information regarding its load bearing capacity. At most, the type of distress showing on the surface indicates if the pavement has received excessive loads. In order to quantify the loads that are acceptable to individual sections of pavement, it is necessary to utilize another assessment methodology. This methodology is called ACN/PCN, which are acronyms for Aircraft Classification Number/Pavement Classification Number. PCN values and codes were determined using the FAA AC 150/5335-5C *Airport Pavement Design and Evaluation*.

Within this methodology, the structural strength of each pavement section is calculated based on its historical and forecast fleet mix, its actual typical section and the strength of its underlying subgrade. Data is compiled and the PCN is determined for each subject pavement section, as defined in the Network definition chapter. The PCN is composed of a numerical value and a series of coded letters. The criteria are as follows:

- Pavement Type
  - R = Rigid
  - F = Flexible
- Subgrade Strength Category
  - A = High (k > 400 psi/in or CBR > 13)
  - B = Medium (k = 201 to 400 psi/in or CBR = 8 to 13)
  - C = Low (k = 100 to 200 psi/in or CBR = 4 to 8)
  - D = Ultra Low (k < 100 psi/in or CBR < 4)
- Maximum Allowable Tire Pressure
  - W = High (no limit)
  - X = Medium (146 – 217 psi)
  - Y = Low (74 – 145 psi)
  - Z = Ultra Low (< 73 psi)
- Pavement Evaluation Method
  - T = Technical Evaluation
  - U = Using Aircraft Evaluation

For example, ACARGON-10 section has a PCN of 64 R/B/W/T, which means that the numerical strength value is 64; it is a rigid pavement; it has an effective subgrade strength between 201 and 400; there is no limit in tire pressure; and the value was actually calculated with a technical evaluation.

In this methodology, the structural strength is calculated so it can easily be compared with the actual loading applied by individual aircraft (ACN) to the pavement. This loading is typically determined by the aircraft manufacturer and is published in the Airport Planning Manuals of

each aircraft. The comparison of the calculated PCN and published ACN is a quick and easy tool for airport and airline operators to determine if specific aircraft are safe (from a structural standpoint) to operate on assigned taxiways, runways and aprons. The ACN/PCN methodology has been the only pavement reporting methodology used by ICAO for years and is now being required within the United States by the FAA. U.S. airports have historically used the Single Wheel Load, Double Wheel Load, etc., pavement reporting method, but the FAA has moved away from this old method and complies with the international PCN method.

5.2 PCN RESULTS

The complete PCN results are listed in **Appendix I.** The critical sections, listed in **Table 5.1** below, represent any pavement section at GSP that has a PCN value of less than 30 or a PCN value that is less than the minimum ACN value for that pavement section. **Table 5.2** on the following page lists the critical aircraft whose ACN values exceed the PCN value of a given pavement section.

Branch	Section	Surface Type	Weight or Traffic Restriction	PCN Code
North Cargo Area	ACARGON-10	PCC	**Yes**	**64 R/B/W/T**
North Cargo Area	ACARGON-20	PCC	**Yes**	**9 R/B/W/T**
South Cargo Area	ACARGOS-20	PCC	**Yes**	**9 R/B/W/T**
Hangar 1	AGEN-20	PCC	**Yes**	**5 R/B/W/T**
Hangar 1	AGEN-30	PCC	**Yes**	**6 R/B/W/T**
Hangar 2	AGEN-10	PCC	**Yes**	**5 R/C/W/T**
Hangar 3	AGEN-40	PCC	**Yes**	**5 R/C/W/T**
Fire Station 1	FS-10, FS-20	PCC	**Yes**	**4 R/C/W/T**
Fire Station 2	AITIN-30	PCC	**Yes**	**5 R/C/W/T**
Runway 04-22	RW04-10 – RW04-60	PCC	**No**	**65 R/B/W/T**
Runway 04-22	RW04-100 – RW04-120	PCC	**No**	**66 R/B/W/T**
Taxilane 2	TL02-10	PCC	**Yes**	**5 R/C/W/T**
Taxilane 2	TL02-15	PCC	**Yes**	**15 R/C/W/T**
Taxilane 2	TL02-30	PCC	**Yes**	**6 R/C/W/T**
Taxiway A	TWA-10	PCC	**No**	**65 R/B/W/T**
Taxiway B	TWB-10	PCC	**No**	**63 R/B/W/T**
Taxiway C	TWC-10	PCC	**No**	**67 R/B/W/T**
Taxiway J	TWJ-10	PCC	**No**	**63 R/B/W/T**
Taxiway K	TWK-10	PCC	**No**	**63 R/B/W/T**
Taxiway L	TWL-10	PCC	**No**	**62 R/B/W/T**
Taxiway L	TWL-20	PCC	**No**	**62 R/B/W/T**
Taxiway L	TWL-40	PCC	**No**	**60 R/B/W/T**
Taxiway L5	TWL5-20	PCC	**Yes**	**15 R/B/W/T**
Taxiway L6	TWL6-10	AC	**Yes**	**2 F/D/X/T**
Taxiway L9	TWCARGO	PCC	**Yes**	**63 R/B/W/T**

Table 5.1 – PCN Results for Critical Sections

A complete analysis was conducted to determine the aircraft that have higher ACN values than the critical sections' PCN. The following table represents the aircraft that are restricted on the critical pavement sections:

Critical Section	Restricted Aircraft
ACARGON-10 **ACARGON-20** **ACARGOS-20** **AGEN-20** **AGEN-30** **AGEN-10** **AGEN-40** **FS-10, FS-20** **AITIN-30** **TL02-10** **TL02-15** **TL02-30** **TWL5-20** **TWL6-10** **TWCARGO**	2DW 150000, 2DW 400000, A300-600, A319-100 std, A320-200 Twin std, A321-200, A330-300, An-124, B707-320C, B717-200, B727-200, B737-200, B737-300, B737-400, B737-700, B737-800, B737-900, B747-400, B757-200, B757-300, B767-200, B767-300, B777-200, B787-8, C-130, C-17A, C-5, MD83, MD90-30, DW 100000, DW150000, DW 200000, DW 50000, DW 75000, SW 30000, SW 45000, SW 75000
RW04-10 – RW04-60 **RW04-100 – RW04-120** **TWA-10** **TWC-10**	A330-300, DW 200000, B777-200, B747-400, B787-8, 2DW 400000
TWB-10 **TWJ-10** **TWK-10** **TWL-10** **TWL-20**	A321-200, B777-200, DW 200000, B747-400, B787-8, 2DW 400000
TWL-40	B737-900, A321-200, DW 200000, B747-400, B787-8, 2DW 400000

Table 5.2 – Restricted Aircraft by Section

Note: Generic gear configurations and maximum aircraft weights are represented in **Table 5.2** in the format "Gear Configuration Max Aircraft Weight (in pounds)" (SW = Single Wheel, DW = Dual Wheel, 2DW = Double Dual Wheel).

5.3 INTERPRETATION OF ACN/PCN RESULTS

The ACN/PCN system is structured such that a pavement with a given PCN can support an aircraft that has an ACN equal to or less than that PCN. Likewise, the pavement cannot, according to the procedure, accept an aircraft with an ACN exceeding the PCN. However, the *Aerodrome Design Manual* does allow for some overloads according to the following criteria (ICAO 2006):

- For flexible pavements, occasional movements by aircraft with an ACN not exceeding 10 percent of the reported PCN should not adversely affect the pavement.
- For rigid or composite pavements, occasional movements by aircraft with an ACN not exceeding 5 percent of the reported PCN should not adversely affect the pavement.
- The annual number of overload movements should not exceed approximately 5 percent of the total annual aircraft movements.

To evaluate the load-carrying capability of the Airport pavement sections using the ACN/PCN procedure, the section PCN is compared with the ACN of the aircraft using that particular section. At GSP, there are several pavement sections that have an ACN value that exceeds the respective PCN value, which indicates that the load bearing capacity of these sections may not be sufficient for the existing and/or forecast fleet mix. It should be noted that the PCC sections of Runway 04-22 are included as "Critical Sections", although the ACN generally does not exceed the PCN by more than 5%. These areas are listed in **Table 5.1** and are represented graphically in **Figure 5.1**.

For reference, below are select aircraft manufacturer published ACN values for select aircraft that may operate at GSP. Each ACN is identified at various subgrade strengths and for both rigid and flexible pavement structures.

Aircraft	Weight	Tire	Flexible pavement sub-grades				Rigid pavement sub-grades			
	Maximum	Pressure	CBR%				k (MPa/m³)			
	(kN)	(MPa)	High	Medium	Low	Very low	High	Medium	Low	Ultra low
			A	B	C	D	A	B	C	D
			15	10	6	3	150	80	40	20
A330-300	2,088	1.31	55	60	70	94	46	54	64	75
B737-900	777	1.47	44	46	51	56	51	53	55	57
B747-400ER	4,061	1.58	57	63	78	100	59	69	81	92
B777-300ER	3,345	1.52	64	71	89	120	66	85	109	131
B787-8	2,240	1.57	60	66	81	106	61	71	84	96
Bombardier CRJ900 Series	377	1.06	21	21	24	27	23	24	26	27
C-17A (Globemaster III)	2,736	0.95	46	51	61	80	55	51	61	76
C-5 Galaxy (Lockheed)	3,723	0.77	31	33	40	51	28	31	37	45
Embraer 170, 175	368	1.04	20	21	24	26	22	24	25	26
Embraer 190, 195	481	1.1	28	30	33	35	31	33	35	36
Embraer ERJ-145 Series	237	0.9	14	15	16	17	16	16	17	18
Gulfstream V	405	1.37	26	28	30	31	31	32	32	33
MD-83	716	1.14	42	45	50	53	47	50	52	54

Table 5.3 – Typical ACN Values for Select Aircraft

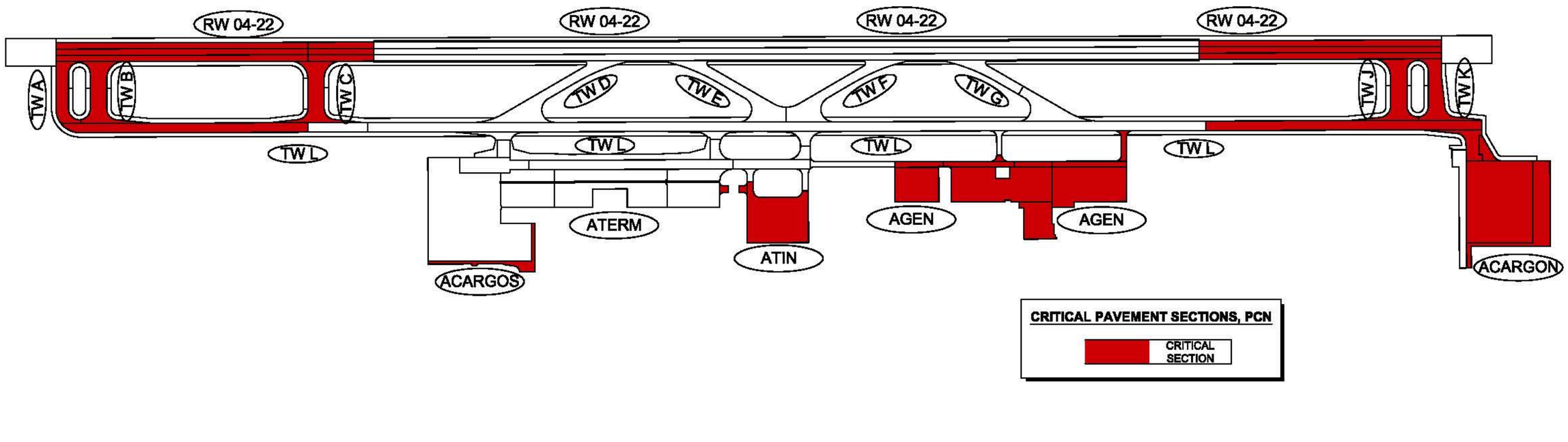


Figure 5.1 – ACN vs. PCN Areas of Concern

These identified sections have an insufficient PCN value because their overall pavement thickness is inadequate, because the subgrade in that area is apparently too weak, or because the pavement was not originally designed for the very heavy load of modern aircraft. As a result, the number of repetitions or the aircraft operating weight should be limited on those sections based on the overload guidance above, until the Pavement is strengthened. The complete PCN results can be referenced in **Appendix I** and the fleet mix used for each section can be referenced in **Appendix G**. These sections will be considered further in the development of the CIP, which is discussed in **Chapter 6**.

5.4 SUMMARY

The ACN/PCN procedure provides an internationally accepted method of analyzing pavement bearing strengths in conjunction with the aircraft using the facility. PCNs were determined for the current aircraft mix at GSP using the methodology described in FAA AC 150/5335-5C. The results indicate that there is one flexible section and twenty-four (24) rigid pavement sections that have ACNs exceeding the pavement's PCNs. Although the proposed aircraft operations do not present any immediate threat to the pavements, the PCN results suggest these pavement sections may require additional structure to meet the growing needs of the Airport.

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

CHAPTER 6: DEVELOPMENT OF AIRFIELD CAPITAL IMPROVEMENT PLAN (CIP)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

CHAPTER 6 – DEVELOPMENT OF AIRFIELD CAPITAL IMPROVEMENT PROGRAM (CIP)

6.1 OVERVIEW

Both the visual surface condition and the structural condition of the entire pavement system provide insight into current pavement performance levels and future maintenance and rehabilitation needs. Short-term needs are turned into project lists, subject to budgetary and operational constraints.

This chapter presents the recommended maintenance and rehabilitation needs for airfield pavement at GSP over a 5-year period starting in 2019 for design and 2020 for construction. A year-by-year breakdown of the recommended projects within the Airfield Capital Improvement Plan (CIP) is presented for this 5-year design period (2019-2023). For this CIP, the recommended construction/rehabilitation projects are assigned to specific years and are presented project cost estimates.

6.2 DEVELOPMENT OF AIRFIELD CAPITAL IMPROVEMENT PROGRAM

Factors Considered in Selection of Candidate Projects

Several different factors are considered in determining whether a pavement is a candidate for rehabilitation within the Airfield CIP. First and foremost, the airfield pavement's overall PCI (presented in Chapter 3), which is an indication of the pavement's ability to safely serve the purpose for which it was designed, is considered. During the life of a pavement, the PCI will decrease. In general, PCIs at different levels suggest that different types of treatments are appropriate, as illustrated in **Table 6.1**.

PCI		Classification	Repair Type
91-100		Excellent	Preventative Maintenance
81-90		Very Good	
71-80		Good	
61-70		Fair	Major Rehabilitation
51-60		Poor	
41-50		Very Poor	
0-40		Failed	Reconstruction

Table 6.1 – Typical Repair Action Based on PCI

Another factor to consider is the importance of the pavement to overall operations. While different pavement facilities across the Airport might have similar PCIs that indicate a need for rehabilitation/maintenance, some pavement sections are more critical to Airport operations than others. For example, a critical PCI on the keel section of Runway 04-22 would trigger a rehabilitation project before the same PCI on a seldom-used taxiway or on a remote apron.

In addition to the pavement condition itself, the *rate* of pavement deterioration is also important. This is especially true for pavements that are not initially triggered for rehabilitation by having reached a critical PCI. A higher-than-average deterioration rate is a strong signal that the pavement may be structurally insufficient or have some other problem, and could soon reach a condition that would present an operational issue. Such pavements should be evaluated to see if the cause of the deterioration can be identified and to determine if the pavements need to be programmed for rehabilitation in the near future. In the case where a pavement section begins to deteriorate rapidly, it should be considered for rehabilitation. Upon evaluation, there were no sections that deteriorated more rapidly than is expected. Thus, the typical rate of deterioration is used to determine the remaining life until the pavement reaches a critical PCI. As discussed in Chapter 4, the critical PCIs are as follows:

- 70 for runways
- 65 for taxiways and aprons
- 65 for shoulders and blast pads

The critical PCI indicates the point at which major rehabilitation should be considered. The remaining life until reaching this critical PCI (in years) is one of the primary factors used in the development of the Airfield CIP.

Additionally, the presence of specific field conditions that might impact operations should be considered. The most important of these is the presence of Foreign Object Debris (FOD) and its potential for damaging aircraft. High-severity alligator cracking, high-severity weathering/raveling, high-severity patches, high-severity materials-related problems, high-severity scaling, and medium- and high-severity joint and corner spalling are conditions that are most likely to create a high FOD potential, and if these distresses are present, the pavement should be considered for immediate rehabilitation localized repairs, at a minimum.

Falling Weight Deflectometer (FWD) testing results from Dynatest's field investigation are also considered in the identification of candidate projects. First, the normalized deflections are evaluated to determine sections with deflections that are much higher than those predicted from elastic layer theory, which indicate a pavement structure that is deficient in some manner, such as due to deterioration within one or more pavement layers or poor subgrade conditions. Likewise, the back-calculated subgrade and pavement layer moduli are evaluated to identify sections with layers of insufficient support. The normalized deflections and back-calculated moduli are also compared to deflections with similar pavement cross sections to investigate potential deficiencies which are easily accomplished by viewing the profile plots illustrating the deflection testing results.

Finally, the pavement's structural capacity is considered in the decision-making process by evaluating the structural remaining life and PCN of each pavement section. The structural remaining life analysis—the results of which are presented in **Chapter 4**—provides an estimation of the life of each pavement section based on the damage applied by the given traffic mix for that particular section. A section with less remaining life indicates that it may have an insufficient structure for the given traffic and is thus given a higher priority within the

Airfield CIP. The PCN of each pavement section (presented in **Chapter 5**) also provides an indication of the pavement's structural capacity. If the ACN of an aircraft loading on a particular pavement section exceeds the PCN of that section, then it is more strongly considered for inclusion in the Airfield CIP.

Ranking of Selection Factors

For each selection factor, a ranking system was established to identify the urgency of each section for rehabilitation, based on the following criteria:

- High – pavement section is in need of immediate attention and should be at the top of the priority list;
- Medium – pavement section needs to be addressed and should be considered after high urgency sections;
- Low – pavement section should be monitored closely and could require minor preventative maintenance; and
- None – pavement section should not require rehabilitation within the next 20 years.

It should be noted that conditions may change over time that affect the pavement's ranking. The recommendations presented herein are based on the information available at the time of this study, which includes current pavement condition data and structural testing data from 2017. The farther out that an action is triggered, the more likely it is that the recommendations may change, which also highlights the need for updating the APMS on a periodic cycle, such as every 3 to 5 years.

Ranking systems were established for three selection factors, which have already been discussed. These factors, and the variables identified for each ranking category, are provided in **Table 6.2**.

Factor	Ranking	Criteria
PCI (Functional) Remaining Life, years	None	> 20
	Low	11 – 20
	Medium	6 – 10
	High	0 – 5
Structural Remaining Life, years	None	> 20
	Low	11 – 20
	Medium	6 – 10
	High	0 – 5
Pavement Classification Number	None	> ACN
	Low	Within 10% of ACN
	Medium	Within 20% of ACN
	High	> 20% below ACN

Table 6.2 – Priority Ranking of Selection Factors

Prioritization of Rehabilitation Projects

An investigation of the ranking of each selection factor was performed to identify and prioritize the projects for inclusion in the Airfield CIP. The PCI and associated distresses are the primary factors used to prioritize the rehabilitation needs using MicroPAVER, and the list of projects generated from MicroPAVER, which includes all pavement sections that fall below the critical PCI, was used as the starting point for prioritizing projects. However, the list was adjusted to consider factors other than PCI and to group proposed work into logical projects. MicroPAVER recommendations for major rehabilitation are generated on a section-by-section basis without regard for any rehabilitation work being performed on adjacent sections. Thus, MicroPAVER could recommend rehabilitation on a section during one year and then recommend rehabilitation of an adjacent section during a subsequent year. Of course, this is neither an economically feasible approach nor does it make sense to close the same area for rehabilitation in consecutive years. The project team looked closely at all sections that were triggered for rehabilitation and tried to group sections into sensible construction projects.

Adequately prioritizing pavement sections recommended for rehabilitation while taking into account all technical data available as part of a pavement management system can be a daunting task. Although the PCI of a section is the primary consideration for prioritizing pavement projects, the structural condition and other factors should also be considered. A summary of the pavement priority rankings for each factor are listed in **Table 6.3**.

Ultimately, all of the factors—overall pavement condition, importance of the facility to Airport operations, overall impact of improvements to that section, and coordination of work among adjacent sections—are collectively considered in the development of the Airfield CIP. A consideration of all of these factors also helps ensure that future potential problems, whether functional or structural, are identified and addressed. Even though a project priority list is developed based on the factors discussed above, these priorities do not necessarily directly correspond to the years that each project is recommended for rehabilitation in the Airfield CIP.

KEY			
Ranking	**PCN Analysis***	**Structural Remaining Life (Years)**	**Functional Remaining Life (Years)**
HIGH	> 20% below ACN	0-5	0-5
MEDIUM	Within 20% of ACN	6-10	6-10
LOW	Within 10% of ACN	11-20	11-20

**PCN of Section was compared to ACN of Critical Aircraft for the Section Surface Type and Subgrade Category.*

Table 6.3 – Priority Rankings for GSP Pavements

Branch ID	Section ID	Pavement Structure	PCN	Structural Remaining Life	Functional Remaining Life (PCI > 40)
ACARGON	10	14" P-501, 8" P-304	64 R/B/W/T	2.4	20+
	20	8" P-501, 8" P-304	9 R/B/W/T	0.3	20+
	30	14" P-501, 8" P-304	64 R/B/W/T	2.4	20+
ACARGOS	10	15" P-501, 8" P-304	> ACN	20+	20+
	20	8" P-501, 6" P-209	9 R/B/W/T	0.5	20+
AGEN	10	6.5" P-501, 12" P-154	5 R/C/W/T	0	20+
	20	6" P-501, 6" P-154	5 R/B/W/T	0	20+
	30	7" P-501, 4" P-209	6 R/B/W/T	0	20+
	40	6.5" P-501, 12" P-154	5 R/C/W/T	0	20+
AITIN	10	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	12
	20	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	3
	30	6" P-501, 6" P-209	5 R/C/W/T	0	20+
ATERM	10	17" P-501, 6" P-304, 6" P-209	> ACN	20+	20+
	20	17" P-501, 6" P-304, 6" P-209	> ACN	20+	20+
	30	17" P-501, 6" P-304, 6" P-209	> ACN	20+	20+
FS	10	6" P-501	4 R/C/W/T	0	20+
	20	6" P-501	4 R/C/W/T	0	16
RW04	10	14" P-501, 8" P-304	65 R/B/W/T	3.2	20+
	20	14" P-501, 8" P-304	65 R/B/W/T	3.2	20+
	30	14" P-501, 8" P-304	65 R/B/W/T	3.2	20+
	40	14" P-501, 8" P-304	65 R/B/W/T	3.2	20+
	50	14" P-501, 8" P-304	65 R/B/W/T	3.2	20+
	60	14" P-501, 8" P-304	65 R/B/W/T	3.2	20+
	70	3.5" P-401, 4" P-401, 2.5" P-401, 6" P-403, 12" P-154	> ACN	20+	20+
	80	3.5" P-401, 4" P-401, 2.5" P-401, 6" P-403, 12" P-154	> ACN	20+	18
	90	3.5" P-401, 4" P-401, 2.5" P-401, 6" P-403, 12" P-154	> ACN	20+	20+
	100	14" P-501, 8" P-304	66 R/B/W/T	5	20+
	110	14" P-501, 8" P-304	66 R/B/W/T	5	20+
	120	14" P-501, 8" P-304	66 R/B/W/T	5	20+
TL01	10	15" P-501, 8" P-304, 12" P-154	> ACN	20+	20+
	20	15" P-501, 8" P-304, 12" P-154	> ACN	20+	20+
	25	17" P-501, 6" P-304, 6" P-209	> ACN	20+	20+
	30	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	4
TL02	10	6.5" P-501, 12" P-154	5 R/C/W/T	0	20+
	15	10" P-501, 6" P-209, 12" P-154	15 R/C/W/T	0.1	20+
	30	7" P-501, 4" P-209	6 R/C/W/T	0	20+
TWA	10	14" P-501, 8" P-304	65 R/B/W/T	3.4	20+
TWB	10	14" P-501, 8" P-304	63 R/B/W/T	1.4	20+
TWC	10	14" P-501, 8" P-304	67 R/B/W/T	8.7	20+
TWCARGO	10	14" P-501, 8" P-304	63 R/B/W/T	0.6	20+
TWD	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	14
TWE	5	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	9
	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	9
TWF	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	5
TWG	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	2
	20	7" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	20+
TWJ	10	14" P-501, 8" P-304	63 R/B/W/T	1.5	20+
TWK	10	14" P-501, 8" P-304	63 R/B/W/T	1.6	20+
TWL	10	14" P-501, 8" P-304	62 R/B/W/T	1.1	20+
	20	14" P-501, 8" P-304	62 R/B/W/T	1.1	20+
	25	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	11
	30	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	11
	40	14" P-501, 8" P-304	60 R/B/W/T	0.3	20+
TWL2	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	11.3	10
	20	15" P-501, 8" P-304, 12" P-154	> ACN	5.6	20+
	30	17" P-501, 6" P-304, 6" P-209	> ACN	20+	20+
TWL3	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	18.4	15
	20	15" P-501, 8" P-304, 12" P-154	> ACN	6.5	20+
TWL4	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	18
	20	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	16
TWL5	10	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	> ACN	20+	18
	20	10" P-501, 6" P-209, 12" P-154	15 R/B/W/T	0.2	20+
TWL6	10	4" P-401, 9" P-209	3 F/D/X/T	0	8

Table 6.4 – Priority Ranking by Pavement Section

Recommended Airfield Capital Improvement Program

The development of the Airfield CIP involved a detailed assessment of each candidate airfield pavement section, as described. Both a "design" year and a "construction" year are identified for each project recommended in the Airfield CIP, with a 1-year lag between these activities. Therefore, the five-year CIP includes design years 2019 through 2023 and construction years 2020 through 2024. This is a simplistic presentation of the design/construction process but serves to provide some tangibility to the project prioritization. Identifying potential areas of concern within the later years of the CIP allows the Airport to plan for these future projects.

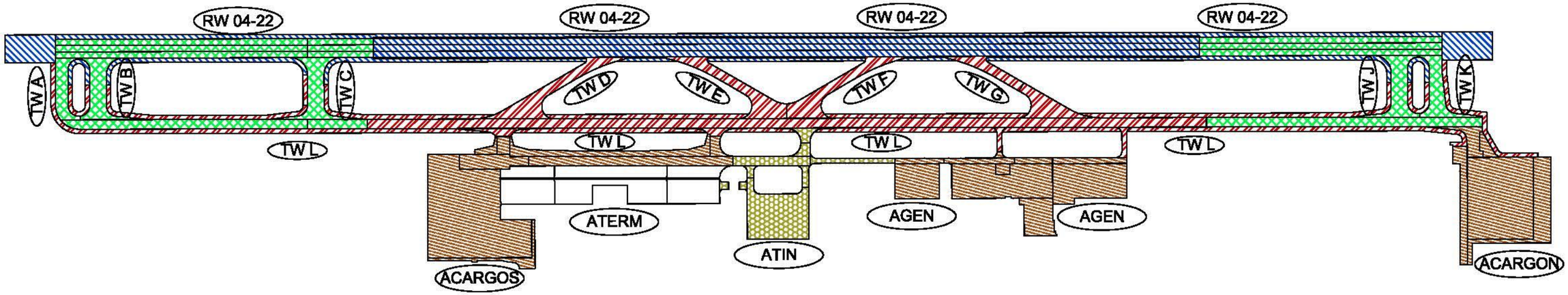
To adequately address the pavement-related needs over the next five years, the projects are placed into design and construction years in a manner that not only addresses the needs determined from this study, but also considers the Airport's input and priorities. If the recommended plan is carried out, the area-weighted PCI of the system is expected to increase. Given the current overall area-weighted PCI of 81, it is realistic to expect a significant increase in the overall area-weighted PCI of the network if each of the rehabilitation projects are performed over the next five years. Each project will significantly boost the respective PCI values within the specific section, thus increasing the overall area-weighted PCI of the entire airfield.

The proposed GSP airfield pavement sections recommended for rehabilitation are listed in **Table 6.5** and presented graphically in **Figure 6.1**. These are estimated and unescalated construction and total project costs for the first 5 years (2019-2023). A breakdown of the expected costs associated with the plan is identified in **Appendix J**. As evident in **Table 6.4**, the costs presented are anticipated "project costs" including not only pavement-related costs (i.e., the cost calculated based on the unit costs presented in **Appendix J**), but also non-pavement-related work, professional fees, contingency fees, and pricing allowances. It should also be noted that no escalation is included in these costs. These costs should provide a reasonable basis for the Airport to use to identify adequate funds to perform the necessary work. A project-level evaluation is still recommended prior to rehabilitation to develop specific rehabilitation designs and guidelines for each project.

Non-pavement related work—such as lighting, turfing, drainage, signage and pavement markings, and so on—is calculated as a percentage of the pavement-related costs. For example, the non-pavement related costs for runway and taxiway pavements may be assumed to be 55 percent of the pavement-related costs, while the costs for apron pavements may be closer to 15 percent. These percentages were developed based on aviation and construction experience and vary per project. The pavement-related costs and non-pavement related costs are combined to produce a "total construction cost," which includes mobilization (10 percent), a detailed pricing allowance (10 percent), and a contingency fee (15 percent). Professional fees (25 percent) are separated into a design fee (11 percent) that occurs in the first year and a construction fee (14 percent) that occurs the following year. The professional fees are then added to the "total construction cost" to determine the "total project cost" (see **Appendix J** for a detailed project cost breakdown).

Priority	Design Year	Construction Year	Project Description	Total Construction Cost	Total Project Cost
1	2019	2020	**Taxiway L & High Speed Taxiways Rehabilitation** *Mill and overlay 4" on Taxiways D & G, mill and overlay 2" on Taxiway L, Taxiways L2 through L4, and shoulders and full depth reconstruction of Taxiways L5 & L6. Remove Taxiways E & F*	$ 7,845,000	$ 11,300,000
2	2020	2021	**Localized PCC Repairs and Joint Sealing - *3 Phases*** *Perform localized PCC repairs and rout, clean and seal joints on PCC portions of the South Cargo Apron, North Cargo Apron, and General Aviation*	$ 1,982,000	$ 2,900,000
3	2021	2022	**Runway 04-22 Asphalt Rehabilitation** *Mill and overlay 2" Runway, Shoulders, and Blast Pad*	$ 6,689,000	$ 9,700,000
4	2022	2023	**Localized PCC Repairs and Joint Sealing** *Perform localized PCC repairs and rout, clean, and seal joints on PCC portions of Runway 04-22 and Taxiways A, B, C, J, K & L*	$ 1,470,000	$ 2,200,000
5	2023	2024	**Reconstruct Itinerant Apron** *Full depth reconstruction on Itinerant Apron, Fire Station Apron and adjacent portion of Taxilane 2*	$ 9,564,000	$ 13,800,000
			Total Five-Year Cost	**$ 27,550,000**	**$ 39,900,000**

Table 6.5 – Recommended GSP Airfield CIP Summary (2019-2024)



AIRFIELD CAPITAL IMPROVEMENT PLAN 2019-2024

	DESIGN YEAR	CONSTRUCTION YEAR	TOTAL PROJECT COST
	2019	2020	PROJECT 1 $11,300,000
	2020	2021	PROJECT 2 $2,900,000
	2021	2022	PROJECT 3 $9,700,000
	2022	2023	PROJECT 4 $2,200,000
	2023	2024	PROJECT 5 $13,800,000

Figure 6.1 – GSP Capital Improvement Plan Map

All estimates within this report are based on 2017 dollars. Annual escalation costs were not included within the pricing. Overall, an average of approximately $8 million per year from 2019 through 2021, $2 million per year is needed in 2022, and $6 million per year is needed in 2023 to address the short-term pavement needs at GSP.

6.3 MAINTENANCE PLAN

MicroPAVER provides a detailed list of immediate maintenance items (next 0 – 2 years) that address the critical distresses identified within the pavement sections. This list was then tailored to eliminate various pavement areas which will be handled in a separate manner or not at all (as described in **Appendix K**).

Maintenance projects are proposed to bridge the gap between the current condition of airfield pavements and the condition of pavement at the time of the full-scale rehabilitation project in the future. Therefore, smaller, maintenance-type projects are formulated to address the worst portions of the pavement until the large-scale project is completed in the long-term plan. The maintenance plan presented in **Appendix K** is based on the specific distresses observed during the 2017 pavement condition inspection, and the costs are specific to those distresses.

Appendix K also details the priority rankings and selection criteria used to prioritize maintenance projects and CIP projects. Based on the distresses observed during the 2017 pavement condition inspection, approximately $850,000 is required to address the Maintenance Projects. See **Appendix K** for the Maintenance Plan and Summary.

6.4 SUMMARY

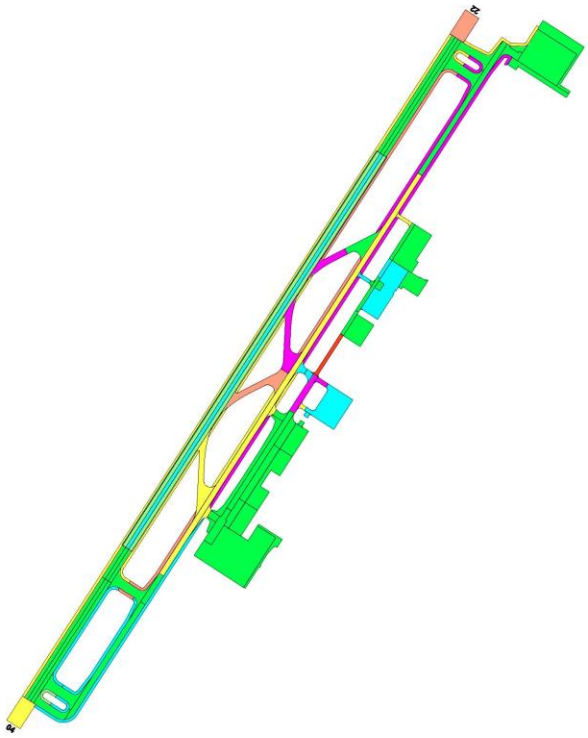
This chapter describes the process that was followed during the development of the Airfield CIP for GSP. The following factors were considered in the development of the recommended program:

- Overall condition of the pavement, including PCI and observed distress types and quantities;
- Functional remaining service life before reaching the critical PCI;
- Structural remaining life;
- Comparison of ACN and PCN;
- Timing of rehabilitation of adjacent sections;
- Coordination of rehabilitation activities both within and between facilities;
- Expected impact of section improvements on the overall pavement network;
- Project costs and annual budgets;
- Maintenance needs and projected costs.

It should be emphasized that the factors that affect performance—such as environment, loadings, construction, and material quality—are highly variable, and that a project may move up or down on the list of recommendations based on actual conditions in any given year. However, these general recommendations should serve as a good approximation of the short-term airfield pavement facility rehabilitation needs at GSP.

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

GREENVILLE-SPARTANBURG AIRPORT DISTRICT



GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

Volume 2 of 2
Appendices

AUGUST 2018

Prepared By

AVCON

AVCON, Inc.

In Association With

McFarland Johnson

TABLE OF CONTENTS

APPENDICES (Volume 2)

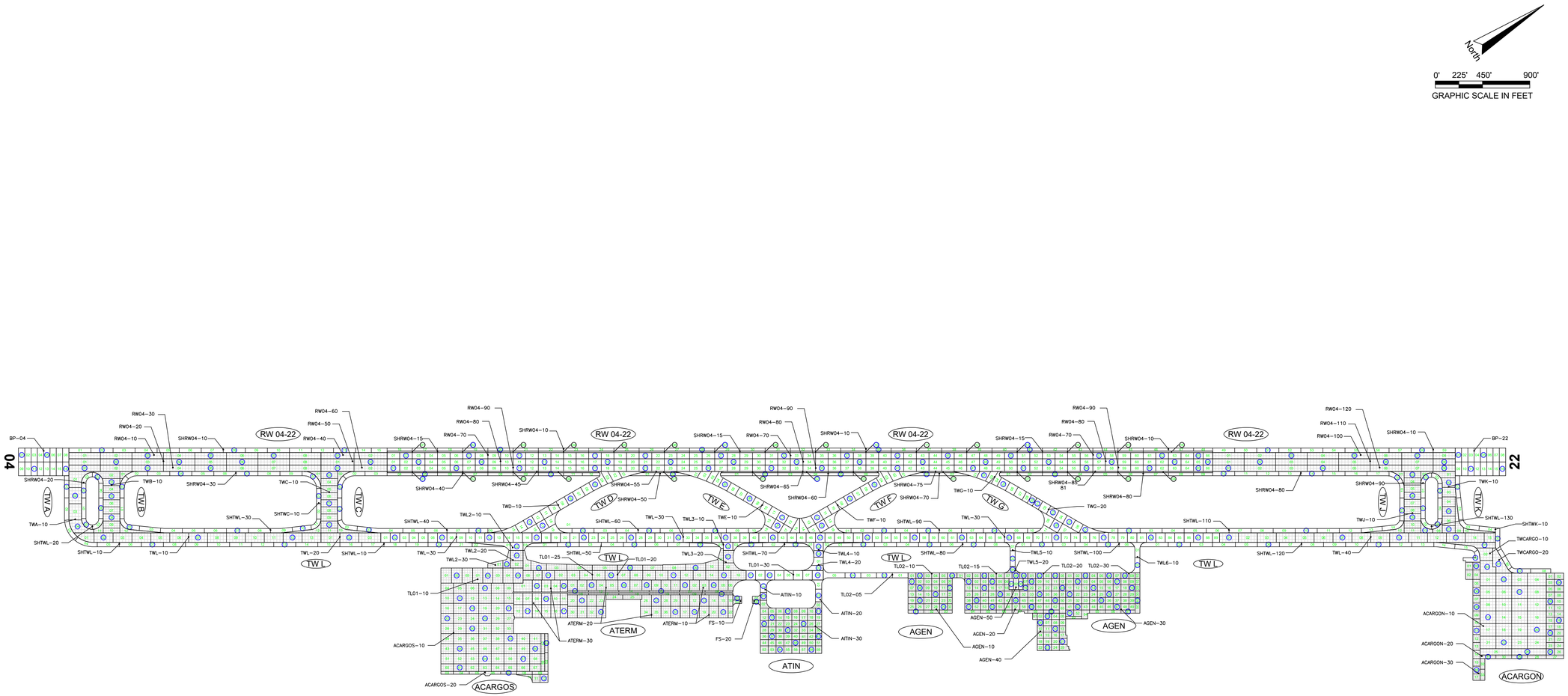
Appendix A – Network Definition Map
Appendix B – Pavement Construction History Table
Appendix C – MicroPAVER Work History Report
Appendix D – MicroPAVER Section/Branch Condition Report
Appendix E – PCI Map
Appendix F – Pavement Distress Types (with Photos)
Appendix G – Air Traffic Data
Appendix H – Remaining Life Data
Appendix I – PCN/ACN Data
Appendix J – Airfield CIP Maps and Data
Appendix K – Maintenance Plan and Summary

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX A: NETWORK DEFINITION MAP

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON



LEGEND

- FACILITY NAME
- SECTION NUMBER
- RW04-120
- 01 — SAMPLE UNIT
- SURVEYED SAMPLE UNIT

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

NETWORK DEFINITION MAP

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY: B.S.H.
DRAWN BY: T.D.B.
CHECKED BY: M.D.
APPROVED BY: S.S.
DATE: AUGUST 2018

AVCON PROJECT NO. 2017.266.01

APP. A

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX B: PAVEMENT CONSTRUCTION HISTORY TABLE

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

Facility	Section	Construction Summary
ACARGON	10	14" P-501 / 8" P-304 (1996)
	20	8" P-501, 8" P-304 (1996)
	30	14" P-501 / 8" P-304 (2001) and 8" P-501 / 8" P-304 (2001)
ACARGOS	10	15" P-501 / 8" P-304 (2002)
	20	8" P-501 /8" P-304 (2002)
AGEN	10	6.5" P-501 / 12" P-154 (2007)
	20	6" P-501 / 6" P-154 (1999) , 6" P-501 / 6" P-154 (2006- Localized Repairs)
	30	7" P-501 / 4" P-209 (1984)
	40	6.5" P-501 / 12" P-154 (2007)
	50	10" P-501 / 6" P-209 / 12" P-155 (2015)
AITIN	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , Unknown Major M&R (2009)
	20	
	30	6" P-501 / 6" P-154 (1962) , 6" P-501 / 6" P-209 (1999 - Localized Repair) , 6" P-501 / 6" P-209 (2006 - Localized Repair)
ATERM	10	17" P-501 / 6" P-304 / 6" P-209 (2017)
	20	
	30	
FS	10	6" P-501 (1963)
	20	
RW04	10	14" P-501 / 8" P-304 (1999)
	20	
	30	
	40	14" P-501 / 8" P-304 (1996)
	50	
	60	
	70	2.5" P-401 / 6" P-403 / 12" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-5.5" P-401 Overlay (1994) , Unknown Overlay (2009)
	80	
	90	
	100	14" P-501 / 8" P-304 (1996)
	110	
	120	
TL01	10	15" P-501 / 8" P-304 / 12" P-154 (2001)
	20	15" P-501 / 8" P-304 / 12" P-154 (2001)
	25	17" P-501 / 6" P-304 / 6" P-209 (2016)
	30	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , Unknown M&R (2009)
TL02	10	6.5" P-501 / 12" P-154 (2006)
	15	10" P-501 / 6" P-209 / 12" P-154 (2015)
	30	7" P-501 / 4" P-209 (1962)
TWA	10	14" P-501 / 8" P-304 (1999)
TWB	10	14" P-501 / 8" P-304 (1999)
TWC	10	14" P-501 / 8" P-304 (1996)
TWCARGO	10	14" P-501 / 8" P-304 (1996)
TWD	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2010)
TWE	5	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2010)
	10	
TWF	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2010)
TWG	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2010)
	20	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , 7" P-401 Mill and Overlay (2016)
TWJ	10	14" P-501 / 8" P-304 (1996)
TWK	10	14" P-501 / 8" P-304 (1996)
TWL	10	14" P-501 / 8" P-304 (1999)
	20	14" P-501 / 8" P-304 (1996)
	25	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay

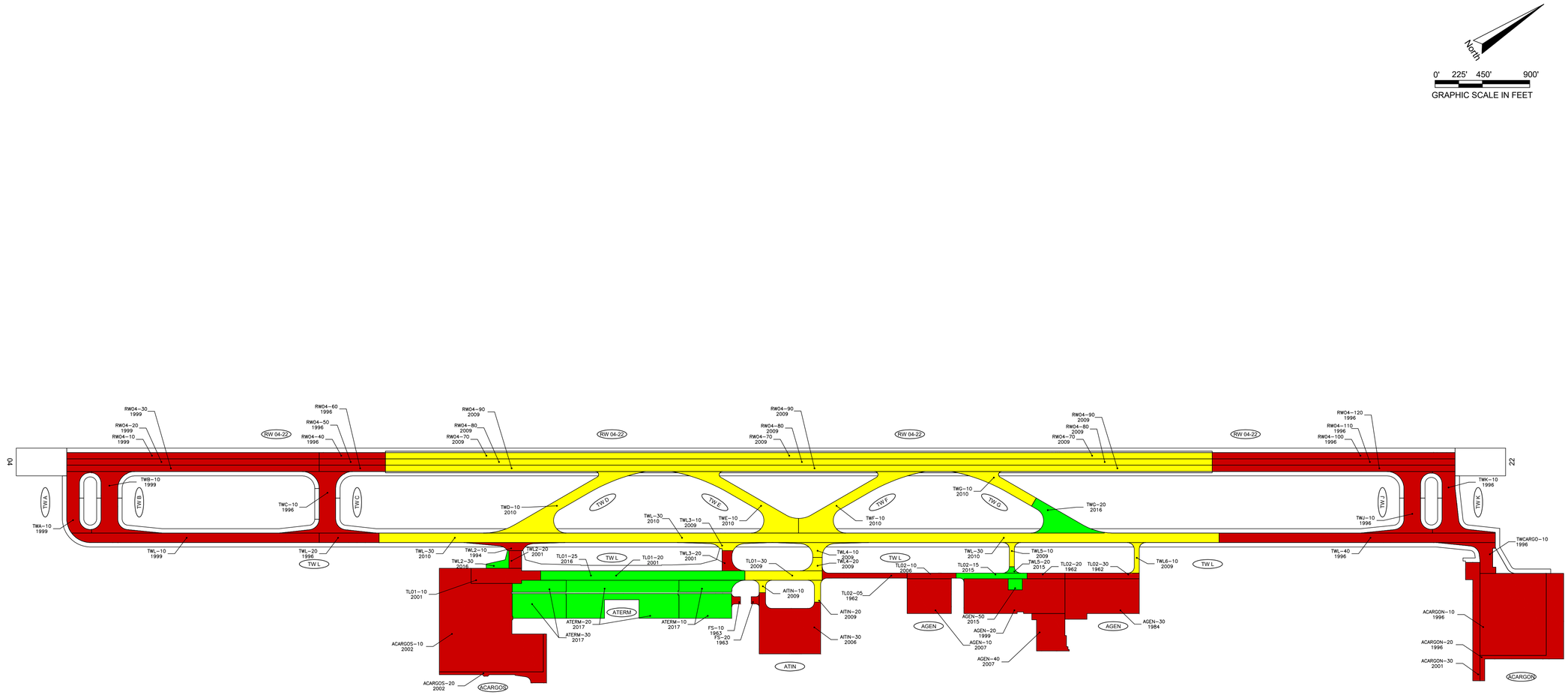
Table B-1 - Construction History Summary

Facility	Section	Construction Summary
TWL	30	/ 2" P-401 (1994) , AC Overlay (2010)
	40	14" P-501 / 8" P-304 (1996)
TWL2	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994)
	20	15" P-501 / 8" P-304 / 12" P-154 (2001)
	30	17" P-501 / 6" P-304 / 6" P-209 (2016)
TWL3	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2009)
	20	15" P-501 / 8" P-304 / 12" P-154 (2001)
TWL4	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2009)
	20	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , AC Overlay (2009)
TWL5	10	3" P-401 / 6" P-403 / 19.5" P-154 (1962) , 4" P-401 Overlay (1976) , 0.5" P-401 Mill / 1.5"-3" P-401 Overlay / 2" P-401 (1994) , AC Overlay (2009)
	20	10" P-501 / 6" P-209 / 12" P-154 (2015)
TWL6	10	4" P-401 / 9" P-209 (1984) , AC Overlay (2009)

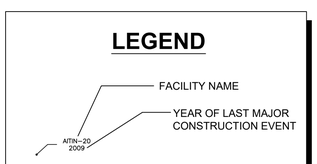
Table B-1 - Construction History Summary (cont'd)

Legend	
Spec. Num.	**Material**
P-154	Subbase
P-155	Lime-Treated Subgrade
P-209	Crushed Aggregate Base Course
P-304	Cement-Treated Base Course
P-401	Hot-Mix Asphalt (HMA) Surface Course
P-403	Hot-Mix Asphalt Base Course
P-501	Portland Cement Concrete (PCC) Pavement

Table B-2 - FAA Specification Legend



LEGEND



GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

CONSTRUCTION HISTORY MAP

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY: B.S.H.
DRAWN BY: T.D.B.
CHECKED BY: M.D.
APPROVED BY: S.S.
DATE: AUGUST 2018

AVCON PROJECT NO. 2017.266.01

APP. B

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX C: MICROPAVER WORK HISTORY REPORT

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

Network: GREENVILLE-SPAR **Branch:** ACARGON NORTH AIR CAR **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** APRON **Rank:** P **Length:** 650.00 (Ft) **Width:** 525.00 (Ft) **True Area:** 341,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** ACARGON NORTH AIR CAR **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** APRON **Rank:** P **Length:** 1,341.00 (Ft) **Width:** 137.00 (Ft) **True Area:** 114,714.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	8" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** ACARGON NORTH AIR CAR **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/2001 **Use:** APRON **Rank:** P **Length:** 762.00 (Ft) **Width:** 100.00 (Ft) **True Area:** 62,212.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2001	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304 AND 8" P-501, 8" P

Network: GREENVILLE-SPAR **Branch:** ACARGOS SOUTH CARGO **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/2002 **Use:** APRON **Rank:** P **Length:** 820.00 (Ft) **Width:** 820.00 (Ft) **True Area:** 508,349.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2002	CR-PC	Complete Reconstruction - PCC			☑	15" P-501, 8" P-304
1/1/1987	NC-PC	New Construction - PCC	0.00	0.00	☑	P-501, P-304

Network: GREENVILLE-SPAR **Branch:** ACARGOS SOUTH CARGO **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2002 **Use:** APRON **Rank:** P **Length:** 1,260.00 (Ft) **Width:** 40.00 (Ft) **True Area:** 37,780.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2002	NC-PC	New Construction - PCC			☑	8" P-501, 6" P-209

Network: GREENVILLE-SPAR **Branch:** AGEN STEVENS GENE **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/2007 **Use:** APRON **Rank:** P **Length:** 350.00 (Ft) **Width:** 275.00 (Ft) **True Area:** 96,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2007	NC-PC	New Construction - PCC			☑	6.5" P-501, 12" P-155

Network: GREENVILLE-SPAR **Branch:** AGEN STEVENS GENE **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** APRON **Rank:** P **Length:** 800.00 (Ft) **Width:** 250.00 (Ft) **True Area:** 209,531.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2006	SL-PC	Slab Replacement - PCC	0.00	0.00	☐	6" P-501, 6" P-154
1/1/1999	SL-PC	Slab Replacement - PCC			☐	6" P-501, 6" P-154
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	6" P-501, 6" P-154

Network: GREENVILLE-SPAR **Branch:** AGEN STEVENS GENE **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/1984 **Use:** APRON **Rank:** P **Length:** 590.00 (Ft) **Width:** 320.00 (Ft) **True Area:** 170,125.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments

Network: GREENVILLE-SPAR **Branch:** AGEN STEVENS GENE **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/1984 **Use:** APRON **Rank:** P **Length:** 590.00 (Ft) **Width:** 320.00 (Ft) **True Area:** 170,125.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1984	NC-PC	New Construction - PCC			☑	7" P-501, 4" P-209

Network: GREENVILLE-SPAR **Branch:** AGEN STEVENS GENE **Section:** 40 **Surface:** PCC
L.C.D.: 1/1/2007 **Use:** APRON **Rank:** P **Length:** 300.00 (Ft) **Width:** 250.00 (Ft) **True Area:** 70,641.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2007	NC-PC	New Construction - PCC			☑	6.5" P-501; 12" P-155

Network: GREENVILLE-SPAR **Branch:** AGEN STEVENS GENE **Section:** 50 **Surface:** PCC
L.C.D.: 1/1/2015 **Use:** APRON **Rank:** P **Length:** 87.00 (Ft) **Width:** 111.00 (Ft) **True Area:** 9,844.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2015	CR-PC	Complete Reconstruction - PCC			☑	10" P-501; 6" P-209; 12" P-155
1/1/2006	SL-PC	Slab Replacement - PCC	0.00	0.00	☐	6" P-501, 6" P-154
1/1/1999	SL-PC	Slab Replacement - PCC	0.00	0.00	☐	6" P-501, 6" P-154
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	6" P-501, 6" P-154

Network: GREENVILLE-SPAR **Branch:** AITIN ITINERANT APR **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** APRON **Rank:** T **Length:** 100.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 5,974.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unkown Major M&R
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	+4 P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** AITIN ITINERANT APR **Section:** 20 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** APRON **Rank:** T **Length:** 175.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 9,316.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown Major M&R
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	+4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** AITIN ITINERANT APR **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/1962 **Use:** APRON **Rank:** T **Length:** 425.00 (Ft) **Width:** 486.00 (Ft) **True Area:** 185,144.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2006	SL-PC	Slab Replacement - PCC	0.00	0.00	☐	6" P-501, 6" P-209
1/1/1999	SL-PC	Slab Replacement - PCC	0.00	0.00	☐	6" P-501, 6" P-209
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	6" P-501, 6" P-154

Network: GREENVILLE-SPAR **Branch:** ATERM AIR CARRIER (T **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/2017 **Use:** APRON **Rank:** P **Length:** 418.00 (Ft) **Width:** 300.00 (Ft) **True Area:** 123,677.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments

Network: GREENVILLE-SPAR **Branch:** ATERM AIR CARRIER (T **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/2017 **Use:** APRON **Rank:** P **Length:** 418.00 (Ft) **Width:** 300.00 (Ft) **True Area:** 123,677.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2017	CR-PC	Complete Reconstruction - PCC			☑	17" P-501, 6" BASE, 6" P-209, 12" P-15
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	11" P-501, 9" P-154

Network: GREENVILLE-SPAR **Branch:** ATERM AIR CARRIER (T **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2017 **Use:** APRON **Rank:** P **Length:** 893.00 (Ft) **Width:** 300.00 (Ft) **True Area:** 219,122.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2017	CR-PC	Complete Reconstruction - PCC			☑	17" P-501, 6" BASE, 6" P-209, 12" P-15
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	11" P-501, 9" P-154

Network: GREENVILLE-SPAR **Branch:** ATERM AIR CARRIER (T **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/2017 **Use:** APRON **Rank:** P **Length:** 422.00 (Ft) **Width:** 300.00 (Ft) **True Area:** 122,490.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2017	CR-PC	Complete Reconstruction - PCC			☑	17" P-501, 6" BASE, 6" P-209, 12" P-15
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	11" P-501, 9" P-154

Network: GREENVILLE-SPAR **Branch:** BP BLASTPAD **Section:** 04 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** OVERRU **Rank:** P **Length:** 400.00 (Ft) **Width:** 220.00 (Ft) **True Area:** 88,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** BP BLASTPAD **Section:** 22 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** OVERRU **Rank:** P **Length:** 400.00 (Ft) **Width:** 220.00 (Ft) **True Area:** 88,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** FS FIRESTATION R **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1963 **Use:** TAXIWAY **Rank:** P **Length:** 70.00 (Ft) **Width:** 57.00 (Ft) **True Area:** 4,235.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1963	NC-PC	New Construction - PCC	0.00	0.00	☑	6" P-501, 6" P-152

Network: GREENVILLE-SPAR **Branch:** FS FIRESTATION R **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/1963 **Use:** TAXIWAY **Rank:** P **Length:** 63.00 (Ft) **Width:** 57.00 (Ft) **True Area:** 3,841.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1963	NC-PC	New Construction - PCC	0.00	0.00	☑	6" P-501, 6" P-152

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** RUNWAY **Rank:** P **Length:** 2,000.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 100,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** RUNWAY **Rank:** P **Length:** 2,000.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 100,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1999	NC-PC	New Construction - PCC	0.00	0.00	☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 100 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** RUNWAY **Rank:** P **Length:** 1,925.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 96,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 110 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** RUNWAY **Rank:** P **Length:** 1,925.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 96,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 120 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** RUNWAY **Rank:** P **Length:** 1,925.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 96,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** RUNWAY **Rank:** P **Length:** 2,000.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 100,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1999	NC-PC	New Construction - PCC	0.00	0.00	☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** RUNWAY **Rank:** P **Length:** 2,000.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 100,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1999	NC-PC	New Construction - PCC	0.00	0.00	☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 40 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** RUNWAY **Rank:** P **Length:** 525.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 26,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	CR-PC	Complete Reconstruction - PCC	0.00	0.00	☑	14" P-501, 8" P-304
1/1/1962	NC-PC	New Construction - PCC			☑	

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 50 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** RUNWAY **Rank:** P **Length:** 525.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 26,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	CR-PC	Complete Reconstruction - PCC	0.00	0.00	☑	14" P-501, 8" P-304
1/1/1962	NC-PC	New Construction - PCC			☑	

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 60 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** RUNWAY **Rank:** P **Length:** 525.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 26,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	CR-PC	Complete Reconstruction - PCC	0.00	0.00	☑	14" P-501, 8" P-304
1/1/1962	NC-PC	New Construction - PCC			☑	

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 70 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** RUNWAY **Rank:** P **Length:** 6,550.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 327,500.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5"-5.5" P-401
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	2.5" P-401, 6" P-201, 12" P-154

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 80 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** RUNWAY **Rank:** P **Length:** 6,550.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 327,500.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5"-5.5" P-401
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	2.5" P-401, 6" P-201, 12" P-154

Network: GREENVILLE-SPAR **Branch:** RW04 RUNWAY 04-22 **Section:** 90 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** RUNWAY **Rank:** P **Length:** 6,550.00 (Ft) **Width:** 50.00 (Ft) **True Area:** 327,500.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5"-5.5" P-401
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	2.5" P-401, 6" P-201, 12" P-154

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 10 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 9,130.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 319,525.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 15 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 6,551.00 (Ft) **Width:** 10.00 (Ft) **True Area:** 65,510.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 20 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 4,501.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 15,741.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 30 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,771.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 61,997.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 40 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,726.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 60,404.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 45 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,679.00 (Ft) **Width:** 10.00 (Ft) **True Area:** 16,792.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 50 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 402.00 (Ft) **Width:** 25.00 (Ft) **True Area:** 10,047.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 55 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 259.00 (Ft) **Width:** 10.00 (Ft) **True Area:** 2,587.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 60 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,255.00 (Ft) **Width:** 25.00 (Ft) **True Area:** 31,379.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 65 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,236.00 (Ft) **Width:** 10.00 (Ft) **True Area:** 12,355.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 70 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 402.00 (Ft) **Width:** 25.00 (Ft) **True Area:** 10,047.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 75 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 259.00 (Ft) **Width:** 10.00 (Ft) **True Area:** 2,587.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 80 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 2,854.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 99,881.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 85 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,682.00 (Ft) **Width:** 10.00 (Ft) **True Area:** 16,819.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHRW04 SHOULDER RUN **Section:** 90 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 441.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 15,420.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWC SHOULDER TAX **Section:** 10 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 243.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 8,503.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWK SHOULDER TAX **Section:** 10 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,330.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 46,553.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 10 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 38,000.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 132,992.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 100 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 917.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 32,100.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 110 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 2,609.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 91,322.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 120 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 2,843.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 99,512.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 130 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 538.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 18,811.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 20 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 541.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 18,920.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 30 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,804.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 63,156.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 40 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,481.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 51,836.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 50 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,412.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 49,437.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 60 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,571.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 55,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 70 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 463.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 16,207.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 80 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,377.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 48,179.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** SHTWL SHOULDER TAX **Section:** 90 **Surface:** AC
L.C.D.: 1/1/1996 **Use:** SHOULDE **Rank:** S **Length:** 1,571.00 (Ft) **Width:** 35.00 (Ft) **True Area:** 55,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-AC	New Construction - AC			☑	3" P-401, 11" P-209

Network: GREENVILLE-SPAR **Branch:** TL01 TAXILANE AIR **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/2001 **Use:** TAXIWAY **Rank:** P **Length:** 550.00 (Ft) **Width:** 120.00 (Ft) **True Area:** 59,307.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2001	CR-PC	Complete Reconstruction - PCC			☑	15" P-501, 8" P-304, 12" P-155
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	11" P-501, 9" P-154

Network: GREENVILLE-SPAR **Branch:** TL01 TAXILANE AIR **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2001 **Use:** TAXIWAY **Rank:** P **Length:** 1,650.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 121,425.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2001	NC-PC	New Construction - PCC			☑	Reconstruction 15" P-501, 8" P-304, 12"

Network: GREENVILLE-SPAR **Branch:** TL01 TAXILANE AIR **Section:** 25 **Surface:** PCC
L.C.D.: 6/1/2016 **Use:** TAXIWAY **Rank:** P **Length:** 1,590.00 (Ft) **Width:** 45.00 (Ft) **True Area:** 87,758.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
6/1/2016	NC-PC	New Construction - PCC			☑	17" P-501, 6" BASE, 6" P-209, 12' P-15

Network: GREENVILLE-SPAR **Branch:** TL01 TAXILANE AIR **Section:** 30 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 640.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 45,956.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	+4" P-401

Network: GREENVILLE-SPAR **Branch:** TL01 TAXILANE AIR **Section:** 30 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 640.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 45,956.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TL02 STEVEN GA APR **Section:** 05 **Surface:** AC
L.C.D.: 1/1/1962 **Use:** TAXIWAY **Rank:** P **Length:** 673.00 (Ft) **Width:** 40.00 (Ft) **True Area:** 27,632.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1962	NC-AC	New Construction - AC			☑	

Network: GREENVILLE-SPAR **Branch:** TL02 STEVEN GA APR **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/2006 **Use:** TAXIWAY **Rank:** P **Length:** 400.00 (Ft) **Width:** 45.00 (Ft) **True Area:** 17,250.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2006	NC-PC	New Construction - PCC			☑	6.5" P-501, 12" P-155

Network: GREENVILLE-SPAR **Branch:** TL02 STEVEN GA APR **Section:** 15 **Surface:** PCC
L.C.D.: 1/1/2015 **Use:** TAXIWAY **Rank:** P **Length:** 550.00 (Ft) **Width:** 45.00 (Ft) **True Area:** 25,193.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2015	CR-PC	Complete Reconstruction - PCC			☑	10" P-501, 6" P-209, 12' STAB BASE
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	

Network: GREENVILLE-SPAR **Branch:** TL02 STEVEN GA APR **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/1962 **Use:** TAXIWAY **Rank:** P **Length:** 300.00 (Ft) **Width:** 45.00 (Ft) **True Area:** 13,500.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1962	NC-PC	New Construction - PCC			☑	

Network: GREENVILLE-SPAR **Branch:** TL02 STEVEN GA APR **Section:** 30 **Surface:** PCC
L.C.D.: 1/1/1962 **Use:** TAXIWAY **Rank:** P **Length:** 590.00 (Ft) **Width:** 45.00 (Ft) **True Area:** 26,550.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1962	NC-PC	New Construction - PCC			☑	7" P-501, 4" P-209

Network: GREENVILLE-SPAR **Branch:** TWA TAXIWAY A **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** TAXIWAY **Rank:** P **Length:** 488.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 50,053.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1999	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWB TAXIWAY B **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** TAXIWAY **Rank:** P **Length:** 488.00 (Ft) **Width:** 132.00 (Ft) **True Area:** 81,551.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1999	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWC TAXIWAY C **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** TAXIWAY **Rank:** P **Length:** 485.00 (Ft) **Width:** 132.00 (Ft) **True Area:** 85,241.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	CR-PC	Complete Reconstruction - PCC			☑	14" P-501, 8" P-304
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	

Network: GREENVILLE-SPAR **Branch:** TWCARGO NORTH CARGO **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** TAXIWAY **Rank:** P **Length:** 245.00 (Ft) **Width:** 110.00 (Ft) **True Area:** 34,240.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWCARGO NORTH CARGO **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2001 **Use:** TAXIWAY **Rank:** P **Length:** 200.00 (Ft) **Width:** 110.00 (Ft) **True Area:** 15,159.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2001	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWD TAXIWAY D **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2010 **Use:** TAXIWAY **Rank:** P **Length:** 950.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 107,176.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2010	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWE TAXIWAY E **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2010 **Use:** TAXIWAY **Rank:** P **Length:** 900.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 100,487.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2010	MOL	Cold Mill and Overlay			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWF TAXIWAY F **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2010 **Use:** TAXIWAY **Rank:** P **Length:** 900.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 100,487.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2010	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWG TAXIWAY G **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2010 **Use:** TAXIWAY **Rank:** P **Length:** 1,000.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 44,563.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2010	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWG TAXIWAY G **Section:** 20 **Surface:** AAC
L.C.D.: 3/1/2016 **Use:** TAXIWAY **Rank:** P **Length:** 1,000.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 62,463.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
3/1/2016	OL-AS	Overlay - AC Structural			☑	7" Mill and 7" P-401 Overlay
1/1/2010	OL-AS	Overlay - AC Structural	0.00	0.00	☑	
1/1/1994	OL-AS	Overlay - AC Structural	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWJ TAXIWAY J **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** TAXIWAY **Rank:** P **Length:** 490.00 (Ft) **Width:** 132.00 (Ft) **True Area:** 82,457.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWK TAXIWAY K **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** TAXIWAY **Rank:** P **Length:** 490.00 (Ft) **Width:** 125.00 (Ft) **True Area:** 70,383.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWL TAXIWAY L **Section:** 10 **Surface:** PCC
L.C.D.: 1/1/1999 **Use:** TAXIWAY **Rank:** P **Length:** 2,425.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 143,669.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1999	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWL TAXIWAY L **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** TAXIWAY **Rank:** P **Length:** 175.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 35,625.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	CR-PC	Complete Reconstruction - PCC			☑	14" P-501, 8" P-304
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	

Network: GREENVILLE-SPAR **Branch:** TWL2 TAXIWAY L2 **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 64.00 (Ft) **Width:** 250.00 (Ft) **True Area:** 16,854.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	OL-AS	Overlay - AC Structural			☑	

Network: GREENVILLE-SPAR **Branch:** TWL2 TAXIWAY L2 **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 64.00 (Ft) **Width:** 250.00 (Ft) **True Area:** 16,854.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWL2 TAXIWAY L2 **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2001 **Use:** TAXIWAY **Rank:** P **Length:** 550.00 (Ft) **Width:** 120.00 (Ft) **True Area:** 14,000.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2001	NC-PC	New Construction - PCC			☑	15" P-501, 8" P-304, 12" P-155

Network: GREENVILLE-SPAR **Branch:** TWL2 TAXIWAY L2 **Section:** 30 **Surface:** PCC
L.C.D.: 8/1/2016 **Use:** TAXIWAY **Rank:** P **Length:** 180.00 (Ft) **Width:** 60.00 (Ft) **True Area:** 11,126.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
8/1/2016	NC-PC	New Construction - PCC			☑	17" P-501, 6" BASE, 6" P-209, 12' P-15

Network: GREENVILLE-SPAR **Branch:** TWL TAXIWAY L **Section:** 30 **Surface:** AAC
L.C.D.: 1/1/2010 **Use:** TAXIWAY **Rank:** P **Length:** 6,650.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 499,349.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2010	OL-AS	Overlay - AC Structural			☑	
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWL3 TAXIWAY L3 **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 64.00 (Ft) **Width:** 160.00 (Ft) **True Area:** 12,137.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWL3 TAXIWAY L3 **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2001 **Use:** TAXIWAY **Rank:** P **Length:** 160.00 (Ft) **Width:** 120.00 (Ft) **True Area:** 14,681.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2001	NC-PC	New Construction - PCC			☑	15" P-501, 8" P-304, 12" P-155

Network: GREENVILLE-SPAR **Branch:** TWL TAXIWAY L **Section:** 40 **Surface:** PCC
L.C.D.: 1/1/1996 **Use:** TAXIWAY **Rank:** P **Length:** 2,185.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 164,175.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/1996	NC-PC	New Construction - PCC			☑	14" P-501, 8" P-304

Network: GREENVILLE-SPAR **Branch:** TWL4 TAXIWAY L4 **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 225.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 16,559.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown
1/1/1994	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWL4 TAXIWAY L4 **Section:** 20 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 225.00 (Ft) **Width:** 75.00 (Ft) **True Area:** 10,098.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154

Network: GREENVILLE-SPAR **Branch:** TWL5 TAXIWAY L5 **Section:** 10 **Surface:** AAC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 195.00 (Ft) **Width:** 40.00 (Ft) **True Area:** 8,754.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown
1/1/1976	OL-AS	Overlay - AC Structural	0.00	0.00	☑	4" P-401
1/1/1962	NC-AC	New Construction - AC	0.00	0.00	☑	3" P-401, 6" P-201, 19.5" P-154
1/1/1944	MOL	Cold Mill and Overlay	0.00	0.00	☑	0.5" MILL, 0.5" P-407, 1.5-3" P-401 LE

Network: GREENVILLE-SPAR **Branch:** TWL5 TAXIWAY L5 **Section:** 20 **Surface:** PCC
L.C.D.: 1/1/2015 **Use:** TAXIWAY **Rank:** P **Length:** 50.00 (Ft) **Width:** 78.00 (Ft) **True Area:** 3,074.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2015	CR-PC	Complete Reconstruction - PCC			☑	10" P-501, 6" P-209, 12' STAB BASE
1/1/1962	NC-PC	New Construction - PCC	0.00	0.00	☑	6" P-501, 6" P-154

Network: GREENVILLE-SPAR **Branch:** TWL6 TAXIWAY L6 **Section:** 10 **Surface:** AC
L.C.D.: 1/1/2009 **Use:** TAXIWAY **Rank:** P **Length:** 241.00 (Ft) **Width:** 42.00 (Ft) **True Area:** 11,403.00 (SqFt)

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
1/1/2009	NONE	No Major M & R			☑	Unknown
1/1/1984	NC-AC	New Construction - AC	0.00	0.00	☑	4" P-401, 9" P-209

Summary:

Work Description	Section Count	Area Total (SqFt)	Thickness Avg (in)	Thickness STD (in)
Cold Mill and Overlay	13	1,989,353.00	0.00	0.00
Complete Reconstruction - PCC	13	1,270,672.00	0.00	0.00
New Construction - AC	51	3,766,327.00	0.00	0.00
New Construction - PCC	46	4,103,122.00	0.00	0.00
No Major M & R	8	120,197.00		
Overlay - AC Structural	28	3,960,991.00	0.00	0.00
Slab Replacement - PCC	6	809,038.00	0.00	0.00

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX D: MICROPAVER SECTION/BRANCH CONDITION REPORT

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

Pavement Database: GSP APMS *NetworkId: GSP*

Branch ID	Section ID	Last Const. Date	Surface	Use	Rank	Lanes	True Area (SqFt)	Last Inspection Date	Age At Inspection	PCI
ACARGON	10	1/1/1996	PCC	APRON	P	0	341,250.00	6/26/2017	21	92
ACARGON	20	1/1/1996	PCC	APRON	P	0	114,714.00	6/26/2017	21	97
ACARGON	30	1/1/2001	PCC	APRON	P	0	62,212.00	6/26/2017	16	96
ACARGOS	10	1/1/2002	PCC	APRON	P	0	508,349.00	6/26/2017	15	93
ACARGOS	20	1/1/2002	PCC	APRON	P	0	37,780.00	6/26/2017	15	99
AGEN	10	1/1/2007	PCC	APRON	P	0	96,250.00	6/26/2017	10	100
AGEN	20	1/1/1999	PCC	APRON	P	0	209,531.00	6/26/2017	18	79
AGEN	30	1/1/1984	PCC	APRON	P	0	170,125.00	6/26/2017	33	100
AGEN	40	1/1/2007	PCC	APRON	P	0	70,641.00	6/26/2017	10	96
AGEN	50	1/1/2015	PCC	APRON	P	0	9,844.00	6/26/2017	2	97
AITIN	10	1/1/2009	AC	APRON	T	0	5,974.00	6/26/2017	8	63
AITIN	20	1/1/2009	AC	APRON	T	0	9,316.00	6/26/2017	8	46
AITIN	30	1/1/1962	PCC	APRON	T	0	185,144.00	6/26/2017	55	73
ATERM	10	1/1/2017	PCC	APRON	P	0	123,677.00	6/26/2017	0	100
ATERM	20	1/1/2017	PCC	APRON	P	0	219,122.00	6/26/2017	0	99
ATERM	30	1/1/2017	PCC	APRON	P	0	122,490.00	6/26/2017	0	100
BP	04	1/1/1996	AC	OVERRUN	P	0	88,000.00	6/26/2017	21	69
BP	22	1/1/1996	AC	OVERRUN	P	0	88,000.00	6/26/2017	21	54
FS	10	1/1/1996	PCC	TAXIWAY	P	0	4,235.00	6/26/2017	21	92
FS	20	1/1/1996	PCC	TAXIWAY	P	0	3,841.00	6/26/2017	21	72
RW04	10	1/1/1996	PCC	RUNWAY	P	0	100,000.00	6/26/2017	21	100
RW04	100	1/1/1996	PCC	RUNWAY	P	0	96,250.00	6/26/2017	21	98
RW04	110	1/1/1996	PCC	RUNWAY	P	0	96,250.00	7/26/2017	21	99
RW04	120	1/1/1996	PCC	RUNWAY	P	0	96,250.00	6/26/2017	21	95
RW04	20	1/1/1996	PCC	RUNWAY	P	0	100,000.00	6/26/2017	21	99
RW04	30	1/1/1996	PCC	RUNWAY	P	0	100,000.00	6/26/2017	21	100
RW04	40	1/1/1996	PCC	RUNWAY	P	0	26,250.00	6/26/2017	21	97
RW04	50	1/1/1996	PCC	RUNWAY	P	0	26,250.00	6/26/2017	21	100
RW04	60	1/1/1996	PCC	RUNWAY	P	0	26,250.00	6/26/2017	21	97
RW04	70	1/1/2009	AC	RUNWAY	P	0	327,500.00	6/26/2017	8	84
RW04	80	1/1/2009	AC	RUNWAY	P	0	327,500.00	6/26/2017	8	75
RW04	90	1/1/2009	AC	RUNWAY	P	0	327,500.00	6/26/2017	8	81
SHRW04	10	1/1/1996	AC	SHOULDER-AF	S	0	319,525.00	6/26/2017	21	63
SHRW04	15	1/1/1996	AC	SHOULDER-AF	S	0	65,510.00	6/26/2017	21	81
SHRW04	20	1/1/1996	AC	SHOULDER-AF	S	0	15,741.00	6/26/2017	21	89
SHRW04	30	1/1/1996	AC	SHOULDER-AF	S	0	61,997.00	6/26/2017	21	78
SHRW04	40	1/1/1996	AC	SHOULDER-AF	S	0	60,404.00	6/26/2017	21	67
SHRW04	45	1/1/1996	AC	SHOULDER-AF	S	0	16,792.00	6/26/2017	21	81
SHRW04	50	1/1/1996	AC	SHOULDER-AF	S	0	10,047.00	6/26/2017	21	70
SHRW04	55	1/1/1996	AC	SHOULDER-AF	S	0	2,587.00	6/26/2017	21	83
SHRW04	60	1/1/1996	AC	SHOULDER-AF	S	0	31,379.00	6/26/2017	21	70

SHRW04	65	1/1/1996	AC	SHOULDER-AF	S	0	12,355.00	6/26/2017	21	81
SHRW04	70	1/1/1996	AC	SHOULDER-AF	S	0	10,047.00	6/26/2017	21	70
SHRW04	75	1/1/1996	AC	SHOULDER-AF	S	0	2,587.00	6/26/2017	21	83
SHRW04	80	1/1/1996	AC	SHOULDER-AF	S	0	99,881.00	6/26/2017	21	53
SHRW04	85	1/1/1996	AC	SHOULDER-AF	S	0	16,819.00	6/26/2017	21	81
SHRW04	90	1/1/1996	AC	SHOULDER-AF	S	0	15,420.00	6/26/2017	21	65
SHTWC	10	1/1/1996	AC	SHOULDER-AF	S	0	8,503.00	6/26/2017	21	55
SHTWK	10	1/1/1996	AC	SHOULDER-AF	S	0	46,553.00	6/26/2017	21	66
SHTWL	10	1/1/1996	AC	SHOULDER-AF	S	0	132,992.00	6/26/2017	21	72
SHTWL	100	1/1/1996	AC	SHOULDER-AF	S	0	32,100.00	6/26/2017	21	41
SHTWL	110	1/1/1996	AC	SHOULDER-AF	S	0	91,322.00	6/26/2017	21	50
SHTWL	120	1/1/1996	AC	SHOULDER-AF	S	0	99,512.00	6/26/2017	21	48
SHTWL	130	1/1/1996	AC	SHOULDER-AF	S	0	18,811.00	6/26/2017	21	49
SHTWL	20	1/1/1996	AC	SHOULDER-AF	S	0	18,920.00	6/26/2017	21	75
SHTWL	30	1/1/1996	AC	SHOULDER-AF	S	0	63,156.00	6/26/2017	21	73
SHTWL	40	1/1/1996	AC	SHOULDER-AF	S	0	51,836.00	6/26/2017	21	58
SHTWL	50	1/1/1996	AC	SHOULDER-AF	S	0	49,437.00	6/26/2017	21	50
SHTWL	60	1/1/1996	AC	SHOULDER-AF	S	0	55,000.00	6/26/2017	21	63
SHTWL	70	1/1/1996	AC	SHOULDER-AF	S	0	16,207.00	6/26/2017	21	61
SHTWL	80	1/1/1996	AC	SHOULDER-AF	S	0	48,179.00	6/26/2017	21	46
SHTWL	90	1/1/1996	AC	SHOULDER-AF	S	0	55,000.00	6/26/2017	21	53
TL01	10	1/1/2001	PCC	TAXIWAY	P	0	59,307.00	2/26/2017	16	97
TL01	20	1/1/2001	PCC	TAXIWAY	P	0	121,425.00	6/26/2017	16	97
TL01	25	6/1/2016	PCC	TAXIWAY	P	0	87,758.00	6/26/2017	1	96
TL01	30	1/1/2009	AC	TAXIWAY	P	0	45,956.00	6/26/2017	8	48
TL02	05	1/1/1962	AC	TAXIWAY	P	0	27,632.00	6/26/2017	55	33
TL02	10	1/1/2006	PCC	TAXIWAY	P	0	17,250.00	6/26/2017	11	95
TL02	15	1/1/2015	PCC	TAXIWAY	P	0	25,193.00	6/26/2017	2	98
TL02	20	1/1/1962	PCC	TAXIWAY	P	0	13,500.00	6/26/2017	55	77
TL02	30	1/1/1962	PCC	TAXIWAY	P	0	26,550.00	6/26/2017	55	99
TWA	10	1/1/1999	PCC	TAXIWAY	P	0	50,053.00	6/26/2017	18	99
TWB	10	1/1/1999	PCC	TAXIWAY	P	0	81,551.00	6/26/2017	18	99
TWC	10	1/1/1996	PCC	TAXIWAY	P	0	85,241.00	6/26/2017	21	98
TWCARGO	10	1/1/1996	PCC	TAXIWAY	P	0	34,240.00	6/26/2017	21	92
TWCARGO	20	1/1/2001	PCC	TAXIWAY	P	0	15,159.00	6/26/2017	16	94

TWD	10	1/1/2010	AC	TAXIWAY	P	0	107,176.00	6/26/2017	7	68
TWE	10	1/1/2010	AC	TAXIWAY	P	0	100,487.00	6/26/2017	7	58
TWF	10	1/1/2010	AC	TAXIWAY	P	0	100,487.00	6/26/2017	7	49
TWG	10	1/1/2010	AC	TAXIWAY	P	0	44,563.00	6/26/2017	7	44
TWG	20	3/1/2016	AC	TAXIWAY	P	0	62,463.00	6/26/2017	1	100
TWJ	10	1/1/1996	PCC	TAXIWAY	P	0	82,457.00	6/26/2017	21	98
TWK	10	1/1/1996	PCC	TAXIWAY	P	0	70,383.00	6/26/2017	21	99
TWL	10	1/1/1996	PCC	TAXIWAY	P	0	143,669.00	6/26/2017	21	96
TWL	20	1/1/1996	PCC	TAXIWAY	P	0	35,625.00	6/26/2017	21	100
TWL	30	1/1/2010	AC	TAXIWAY	P	0	499,349.00	6/26/2017	7	61
TWL	40	1/1/1996	PCC	TAXIWAY	P	0	164,175.00	6/26/2017	21	98
TWL2	10	1/1/2009	AC	TAXIWAY	P	0	16,854.00	6/26/2017	8	70
TWL2	20	1/1/2001	PCC	TAXIWAY	P	0	14,000.00	6/26/2017	16	94
TWL2	30	8/1/2016	PCC	TAXIWAY	P	0	11,126.00	6/26/2017	1	98
TWL3	10	1/1/2009	AC	TAXIWAY	P	0	12,137.00	6/26/2017	8	69
TWL3	20	1/1/2001	PCC	TAXIWAY	P	0	14,681.00	6/26/2017	16	95
TWL4	10	1/1/2009	AC	TAXIWAY	P	0	16,559.00	6/26/2017	8	75
TWL4	20	1/1/2009	AC	TAXIWAY	P	0	10,098.00	6/26/2017	8	71
TWL5	10	1/1/2009	AC	TAXIWAY	P	0	8,754.00	6/26/2017	8	76
TWL5	20	1/1/2015	PCC	TAXIWAY	P	0	3,074.00	6/26/2017	2	100
TWL6	10	1/1/2009	AC	TAXIWAY	P	0	11,403.00	6/26/2017	8	56

Section Condition Report (Summary)

Pavement Database: GSP APMS

Age Category	Average Age at Inspection	Total Area (SqFt)	Number of Sections	Arithmetic Average PCI	Standard Deviation PCI	Weighted Average PCI
00-02	1	664,747.00	9	98.67	1.41	98.99
06-10	8	2,138,504.00	19	67.89	15.47	71.90
11-15	14	563,379.00	3	95.67	2.49	93.46
16-20	17	627,919.00	9	94.44	5.74	91.13
21-25	21	3,451,949.00	52	77.25	18.26	79.75
31-35	33	170,125.00	1	100.00	0.00	100.00
Over 50	55	252,826.00	4	70.50	23.81	71.57
ALL	17	7,869,449.00	97	79.53	18.76	81.31

Branch Condition Report

Pavement Database: GSP APMS

Branch ID	Number of Sections	Sum Section Length (Ft)	Avg Section Width (Ft)	True Area (SqFt)	Use	Average PCI	Standard Deviation PCI	Weighted Average PCI
ACARGON	3	2,753.00	254.00	518,176.00	APRON	95.00	2.16	93.59
ACARGOS	2	2,080.00	430.00	546,129.00	APRON	96.00	3.00	93.42
AGEN	5	2,127.00	241.20	556,391.00	APRON	94.40	7.86	91.53
AITIN	3	700.00	195.33	200,434.00	APRON	60.67	11.15	71.45
ATERM	3	1,733.00	300.00	465,289.00	APRON	99.67	0.47	99.53
BP	2	800.00	220.00	176,000.00	OVERRUN	61.50	7.50	61.50
FS	2	133.00	57.00	8,076.00	TAXIWAY	82.00	10.00	82.49
RW04	12	33,000.00	50.00	1,650,000.00	RUNWAY	93.75	8.28	87.47
SHRW04	15	34,148.00	23.00	741,091.00	SHOULDER-	74.33	9.44	67.16
SHTWC	1	243.00	35.00	8,503.00	SHOULDER-	55.00	0.00	55.00
SHTWK	1	1,330.00	35.00	46,553.00	SHOULDER-	66.00	0.00	66.00
SHTWL	13	55,127.00	35.00	732,472.00	SHOULDER-	56.85	10.72	57.68
TL01	4	4,430.00	78.75	314,446.00	TAXIWAY	84.50	21.08	89.56
TL02	5	2,513.00	44.00	110,125.00	TAXIWAY	80.40	25.01	78.89
TWA	1	488.00	75.00	50,053.00	TAXIWAY	99.00	0.00	99.00
TWB	1	488.00	132.00	81,551.00	TAXIWAY	99.00	0.00	99.00
TWC	1	485.00	132.00	85,241.00	TAXIWAY	98.00	0.00	98.00
TWCARGO	2	445.00	110.00	49,399.00	TAXIWAY	93.00	1.00	92.61
TWD	1	950.00	75.00	107,176.00	TAXIWAY	68.00	0.00	68.00
TWE	1	900.00	75.00	100,487.00	TAXIWAY	58.00	0.00	58.00
TWF	1	900.00	75.00	100,487.00	TAXIWAY	49.00	0.00	49.00
TWG	2	2,000.00	75.00	107,026.00	TAXIWAY	72.00	28.00	76.68
TWJ	1	490.00	132.00	82,457.00	TAXIWAY	98.00	0.00	98.00
TWK	1	490.00	125.00	70,383.00	TAXIWAY	99.00	0.00	99.00
TWL	4	11,435.00	75.00	842,818.00	TAXIWAY	88.75	16.08	75.82
TWL2	3	794.00	143.33	41,980.00	TAXIWAY	87.33	12.36	85.42
TWL3	2	224.00	140.00	26,818.00	TAXIWAY	82.00	13.00	83.23
TWL4	2	450.00	75.00	26,657.00	TAXIWAY	73.00	2.00	73.48
TWL5	2	245.00	59.00	11,828.00	TAXIWAY	88.00	12.00	82.24
TWL6	1	241.00	42.00	11,403.00	TAXIWAY	56.00	0.00	56.00

Pavement Database: GSP APMS

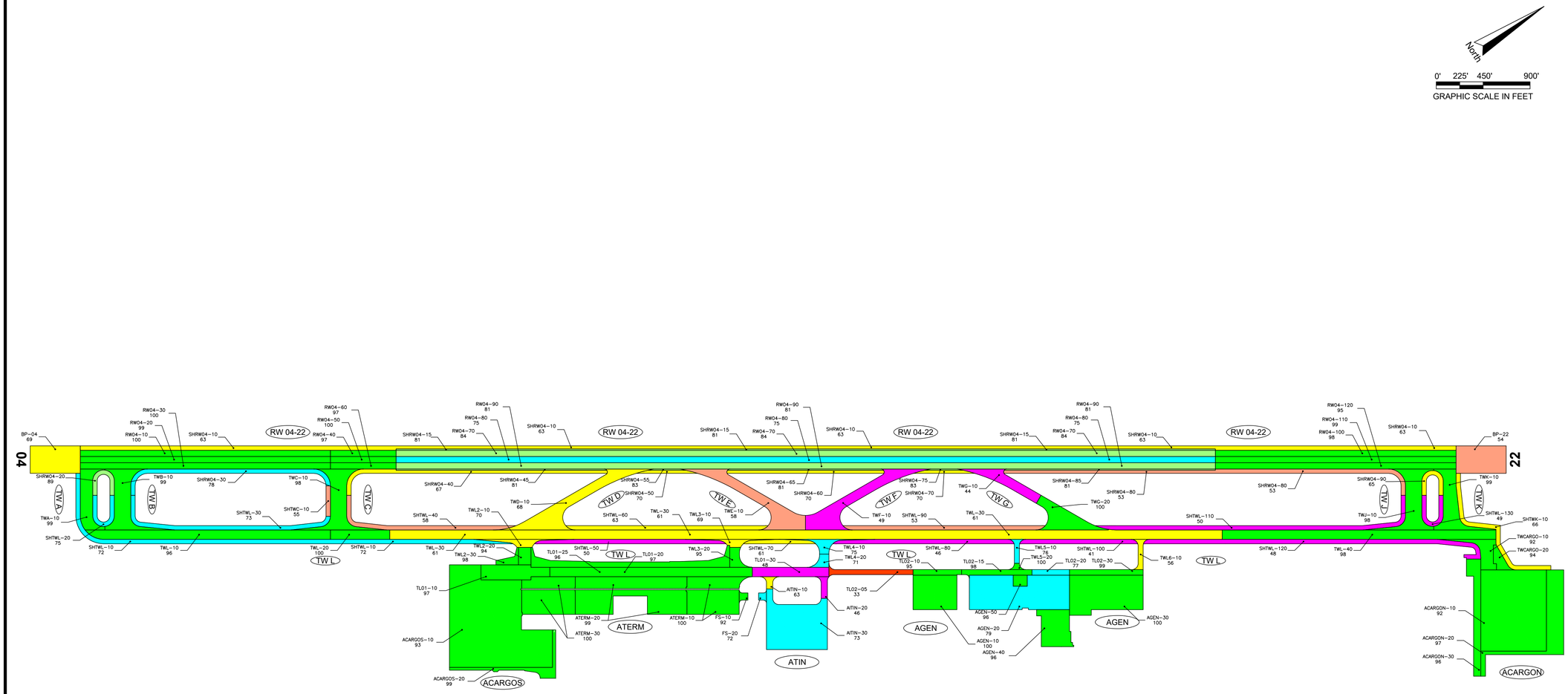
Use Category	Number of Sections	Total Area (SqFt)	Arithmetic Average PCI	Average STD PCI	Weighted Average PCI
APRON	16	2286419.00069891	89.38	15.44	92.31
OVERRUN	2	176000.000053799	61.50	7.50	61.50
RUNWAY	12	1650000.00050437	93.75	8.28	87.47
SHOULDER-AF	30	1528619.00046726	65.83	13.02	62.51
TAXIWAY	37	2228411.00068117	82.73	19.23	79.91
ALL	97	7869449.00240551	79.53	18.76	81.31

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX E: PCI MAP

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON



LEGEND

FACILITY NAME

AITIN-20
46

PCI

PAVEMENT CONDITION INDEX (PCI)

91-100		EXCELLENT
81-90		VERY GOOD
71-80		GOOD
61-70		FAIR
51-60		POOR
41-50		VERY POOR
0-40		FAILED

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

PAVEMENT CONDITION INDEX (PCI) MAP

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY: B.S.H.
DRAWN BY: T.D.B.
CHECKED BY: M.D.
APPROVED BY: S.S.
DATE: AUGUST 2018

AVCON PROJECT NO. 2017.266.01

APP. E

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX F: PAVEMENT DISTRESS TYPES (WITH PHOTOS)

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

APPENDIX F – PAVEMENT DISTRESS TYPES

Examples of various pavement distress types identified in this Appendix are presented by name in alphabetical order to assist airfield pavement inspectors. The various photographs are presented to aid in the identification, severity, location, extent, and probable cause of pavement distress for both flexible and rigid pavement types.

All the photographs of various pavement distresses to both Asphalt (AC) and Portland Concrete Cement (PCC) pavements were collected at Greenville-Spartanburg International Airport and assembled specifically for this report.

AC-Surface Pavement Distresses

BLEEDING

Bleeding is upward movement of asphalt in an asphalt pavement, resulting in the formation of a shiny, sticky film of asphalt on the surface. Bleeding primarily occurs when there is an excessive amount of asphalt cements or tar in the mix or the mix has a low air-void content. During hot weather, the asphalt fills the air voids and expands to the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt or tar will accumulate on the surface.

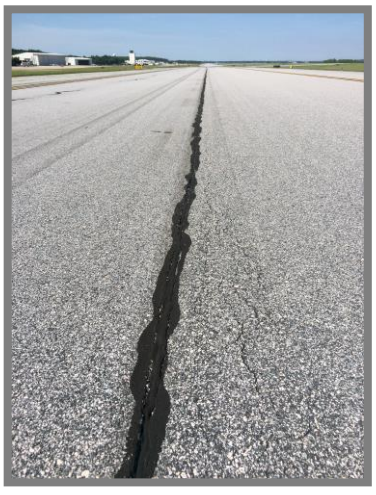
Bleeding – Taxiway L

LONGITUDINAL AND TRANSVERSE (L&T) CRACKING

A common distress type found on the AC-surfaced pavements at Greenville-Spartanburg International Airport is longitudinal and transverse (L&T) cracking. This distress is considered climate-related and is typically found where paving lane joints have opened or where cracks have formed due to temperature fluctuations. On overlaid pavements, cracks in the underlying pavement may eventually reflect to the surface layer, also causing this type of distress to occur.

In terms of severity levels, low-severity cracks are either non-filled, lightly spalled cracks with a mean width less than ¼ inch or are properly sealed cracks of any width. A medium-severity rating is given to non-sealed, moderately spalled cracks and to non-sealed cracks having a mean width greater than ¼ inch. Cracks containing sealant that is no longer in satisfactory condition are also rated as medium severity.

Longitudinal/Transverse Cracking – Taxilane 1



Longitudinal/Transverse Cracking – Taxiway L

High-severity cracks are defined as having significant foreign object debris (FOD) due to severe spalling of the crack and often contain associated loose and broken pieces of pavement and the potential to cause damage to aircraft.

Longitudinal/Transverse Cracking – Taxiway E/F

BLOCK CRACKING

Block cracking is a climate-related distress that is present on various pavement sections at Greenville-Spartanburg International Airport. Over time, oxidation acts to stiffen the asphalt binder in the pavement, thereby limiting the pavement's ability to absorb the stresses of thermal cycling. This distress, which is the natural progression from L&T cracking, generally appears over relatively large areas as a series of longitudinal and transverse cracks arranged in a pattern of square or rectangular blocks, with sizes varying from 2 to 10 feet square. The severity levels for block cracking are defined in the same manner as for L&T cracking.

Block Cracking – Taxiway F & Taxiway L Intersection

Block Cracking – Taxilane 1

OIL SPILLAGE

Oil spillage is the deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents. There are no degrees of severity for oil spillage, it is sufficient to indicate the existence of oil spillage.

Oil Spillage

PATCHING

Patching is identified as a distress because it is not an original design feature of the pavement structure. This distress type includes all partial-depth and full-depth patches, as well as utility cuts. Low-severity patches are in good condition, medium-severity patches have some deterioration and/or have a minor effect on ride quality, and high-severity patches are badly deteriorated and producing FOD or have a significant effect on ride quality.

Patching – Taxiway G

RUTTING

Rutting – Taxiway G

Rutting is characterized by surface depressions located in the wheel path. These depressions are typically caused by consolidation or lateral movement of the material in any pavement layer or a combination of pavement layers due to repeated traffic loadings. Areas of low-severity rutting exhibit rut depths that are ¼ to ½ inch in depth, while medium-severity ruts are characterized by ruts that are greater than ½ inch and less than 1 inch in depth. High-severity rutting is defined as any rut that is deeper than 1 inch. Rutting at GSP was observed primarily on Taxiway G.

SLIPPAGE CRACKING

Slippage cracks are characterized by crescent-shaped cracks having two ends pointed away from the direction of traffic. These types of cracks are typically located near turning or breaking areas and are produced when the turning or breaking of aircraft cause the pavement surface to deform. Slippage cracks were primarily observed on Taxiway G at GSP.

Slippage Cracking – Taxiway G

Slippage Cracking – Taxiway G

A low-strength surface mix or a poor bonding condition between the AC surface and underlying layers can also be a contributing factor to slippage cracking. No severity levels are associated with slippage cracking. Placement of asphalt layers that are too thin is another possible cause of slippage.

Slippage Cracking – Taxiway G

SWELLING

Swelling is characterized by an upward bulge in the pavement's surface. A swell may occur sharply over a small area or as a longer, gradual wave. Either type of swell can be accompanied by surface cracking.

Swelling – Taxiway L and Taxiway F Intersection

Swelling – Taxiway L and Taxiway F Intersection

WEATHERING

Weathering is the wearing away of the asphalt binder and the fine aggregate from the pavement surface. Weathering is caused by age of the asphalt pavement and climatic weather conditions.

Weathering and L&T Cracking –Runway 4-22 Shoulder

Weathering & Longitudinal Cracking – Runway 4-22

PCC-Surface Pavement Distresses

CORNER BREAK

A corner break is a crack in a PCC slab that intersects two joints at a distance less than one half of the slab length and is characterized by a crack that extends vertically through the entire slab thickness (rather than at an angle like corner spalls). Corner breaks are typically caused by load repetitions combined with loss of subgrade support and/or curling/warping stresses.

Corner Break – General Aviation Apron

Corner Break – Fire Station Apron

A low-severity corner break is associated with a crack that has little to no spalling and has a width of less than 1/8 inch. A corner break is classified as medium severity if the associated crack is not filled and is moderately spalled or has a mean width of 1/8 to 1 inch. For filled cracks, a corner break is considered medium severity if the filler is in unsatisfactory condition but not spalling or if the area between the corner break and the joints is slightly cracked. High-severity corner breaks are characterized by filled or non-filled cracks that are severely spalled, non-filled cracks with a width greater than 1 inch, or severe cracking between the crack and the joint.

LONGITUDINAL, TRANSVERSE, AND DIAGONAL (LTD) CRACKING

Longitudinal/Transverse/Diagonal Crack – Fire Station Apron

Longitudinal, transverse, and diagonal (LTD) cracks divide the slab into either two or three pieces and are caused by a combination of traffic loadings, curling stresses, and shrinkage stresses in the slab. LTD cracks were observed on the older PCC-surfaced pavements at Greenville-Spartanburg International Airport.

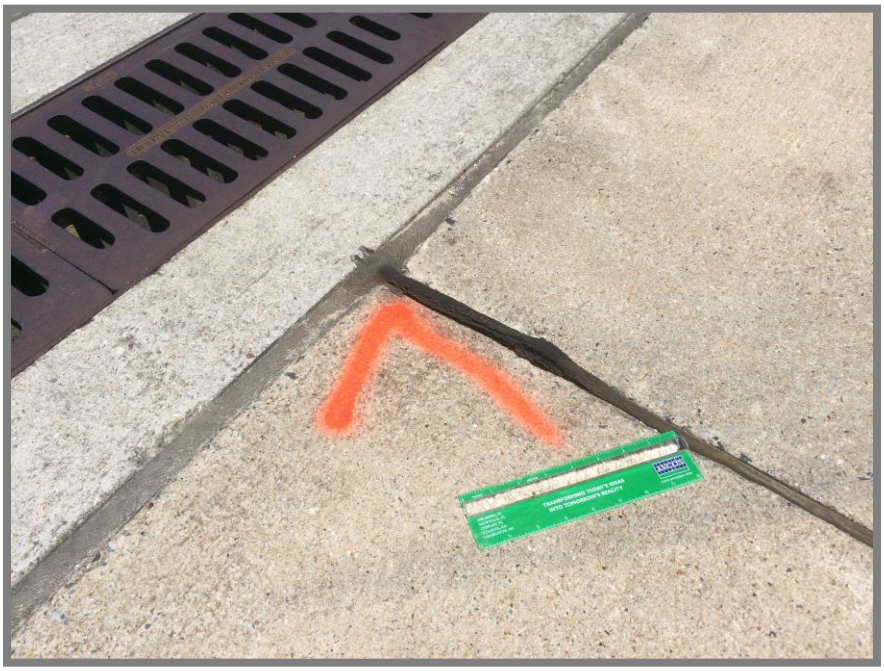
Low-severity LTD cracks are characterized by a crack with little to no spalling or a filled crack with filler in satisfactory condition. If a slab is divided into three pieces by low-severity cracks, the crack is still considered low severity. Medium-severity LTD cracking is recorded if a non-filled crack is moderately spalled or has a width between 1/8 and 1 inch, if a filled crack is not spalled but the filler is in unsatisfactory condition, or if the slab is divided into three pieces and one of the cracks is at least medium severity. An LTD crack is considered high severity when non-filled cracks are severely spalled causing a definite FOD potential or if the crack is greater than 1 inch in width. High-severity LTD cracking is also recorded when a slab is separated into two or three pieces and at least one of the cracks is a high-severity crack.

Longitudinal/Transverse/Diagonal Crack – Fire Station Apron

Longitudinal/Transverse/Diagonal Crack – Hangar 1

JOINT SEAL DAMAGE

Joint seal damage is recorded when the joint sealant is damaged to a point that it enables soil, rock, or other debris to accumulate in the joint or allows significant infiltration of water. Examples of joint seal damage include stripping of the joint sealant, extrusion of joint sealant, weed growth, hardening of the filler, or absence of the joint sealant.



Joint Seal Damage – North Cargo Area

Joint Seal Damage – North Cargo Area

Low-severity joint seal damage is recorded when the joint sealer is in good condition with only a minor amount of damage. Joint seal damage is recorded as medium severity if the joint sealant is in fairly good condition over the entire sample but one or more of the damage criteria are exhibited. If the joint sealant is in place but water can penetrate openings of 1/8 inch or less, if vegetation is present in the joint, or if the sealant is oxidized or hardened, medium-severity joint seal damage is recorded. If the joint sealant is in poor condition over the entire sample or if more than 10 percent of the sealant is missing and needs to be replaced, high-severity joint seal damage is recorded.

Joint Seal Damage & Patching – Fire Station Apron

PATCHING

Patching is an area where the original pavement has been removed and replaced with a filler material. Patches constitute a distress because they are not a part of the original pavement structure. Patches are separated into small (less than 5 square feet) and large (greater than 5 square feet). Patching was identified on numerous PCC pavement sections at Greenville-Spartanburg International Airport.

Patching – Taxiway L9

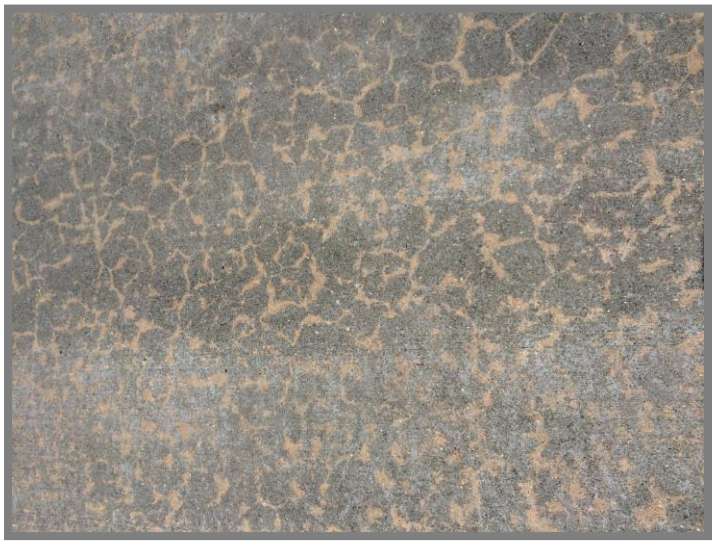
A patch is considered low-severity if it is functioning well with little to no deterioration. Medium-severity patching is a patch that exhibits some deterioration or moderate spalling and possibly minor FOD potential. High-severity patching is recorded when a patch is severely deteriorated either by spalling or cracking within the patch. High-severity patches warrant immediate replacement as they pose a significant FOD potential.

Utility Patching – North Cargo Area

Patching – Air Carrier Terminal Apron

SCALING

Surface deterioration caused by construction defects, material defects and environmental factors. Generally, scaling is exhibited by delaminating or disintegration of paste on the slab surface to the depth of the defect. Construction defects include over-finishing, addition of water to the pavement surface during finishing, lack of curing, attempted surface repairs of fresh concrete with mortar. Material defects include inadequate air entrainment for the climate. Environmental factors include freezing of concrete before adequate strength gained or thermal cycles from certain aircraft.



Scaling – Hangar 2

Scaling – North Cargo Area

SHATTERED SLABS

Shattered Slab – Fire Station Apron

A PCC slab is considered shattered when interconnecting cracks break the slab into four or more pieces. Shattered slabs are typically caused by excessive load repetitions on the pavement. If a shattered slab is recorded, no other distresses are recorded on that slab.

In terms of severity levels, a shattered slab is considered low severity when the slab is broken into four or more pieces defined by low-severity cracks. Medium-severity shattered slabs are slabs that are broken into four or five pieces with 15 percent of the interconnecting cracks being medium severity or a slab that is broken into six or more pieces with over 85 percent of the cracks at low-severity. A high-severity shattered slab is characterized by a slab that is broken into four or five pieces with some or all of the cracks being high severity or a slab that is broken into six or more pieces with over 15 percent of the cracks being medium or high severity.

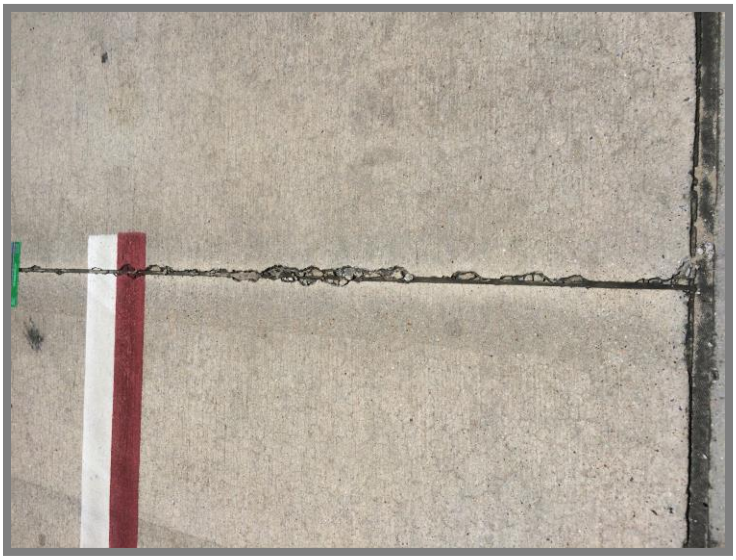
Shattered Slab – Fire Station Apron

SHRINKAGE CRACKING

Shrinkage cracks are small hairline cracks that usually do not extend through the depth of the slab, are very short in length, and therefore do not extend across the entire length/width of the slab. These cracks are typically formed during the setting and curing of the PCC pavement. No severity levels are defined for shrinkage cracks.

Shrinkage Cracking – Runway 4-22

JOINT SPALLING



Joint Spalling – North Cargo Area

Joint spalling is the breakdown of the slab edges within 2 feet of the joint and is typically caused by excessive stresses at the joint and repeated traffic loadings. Overworking of the PCC during construction often weakens the surface near the joints and can also result in spalling. Joint spalls typically do not extend vertically though the slab (as with cracks and corner breaks) but instead intersect the joint at an angle.

Joint Spalling – South Cargo Area

Joint spalls are considered low severity if the spall is less than 2 feet in length and is broken into no more than three pieces with little to no FOD potential. Medium-severity joint spalls are characterized by spalls over 2 feet in length that are broken into more than three pieces with some existing FOD potential. If a spall is less than 2 feet in width, it is considered medium severity if there are loose or missing pieces causing the potential for FOD. A high-severity spall is one that is broken into three or more pieces defined by one or more high-severity cracks.

Joint Spalling – North Cargo Area

CORNER SPALLING

Corner Spalling – Taxiway L9

Corner spalling, again exhibited on a majority of the PCC pavement sections, is very similar to joint spalling except the spall is located near the corner of the PCC slab. In terms of severity levels, the definitions are also similar. Low-severity corner spalls are spalls created by low-severity cracks and do not create any FOD potential. Medium-severity corner spalls are defined by medium-severity cracks having some loose or missing pieces, and high-severity corner spalls are defined by spalls that are made up of high-severity cracks with missing or loose material, therefore creating a high FOD potential.

Corner Spalling – Hangar 1

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX G: AIR TRAFFIC DATA

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

APPENDIX G – AIR TRAFFIC DATA

The characterization of traffic operations is an important part of the analysis and design of airport pavement facilities. Not only does it provide insight into the current performance of the existing pavement, it is also essential for the development of appropriate structural designs (either new pavement designs or rehabilitation designs) of sufficient thickness to withstand the repeated traffic loadings over the design life of the pavement. In addition, traffic is a critical input in the determination of structural Remaining Life and the Pavement Classification Number (PCN).

Traffic values are for use in the network-level evaluation of the airfield pavements at Greenville-Spartanburg International Airport. The traffic values presented herein are developed for the sole purpose of evaluating the pavement sections for inclusion into the Capital Improvement Program (CIP). They should not be used for other purposes, such as or project-level pavement design.

The determination of design and rehabilitation needs for a pavement facility is based largely on its projected traffic. Consequently, current and projected traffic loadings are needed to determine structural remaining life and to develop appropriate rehabilitation designs. The most recent traffic data is summarized in **Table G.1** and **Table G.2** on the following pages. **Table G.1** represents the total fleet and operations and will be utilized for all commercial service pavements. **Table G.2** represents the modified fleet and airport operations, which excludes aircraft over 100,000 pounds, and will be used for General Aviation pavements. **Table G.3** identifies the pavement sections and the utilized fleet and operations. This data was compiled from the Traffic Flow Management System Counts (TFMSC) Report for one year, October 2016 to September 2017.

Traffic Flow Assumptions

The entire fleet mix at GSP was divided into two categories for the purpose of PCN calculations and Remaining Life Analysis. This was done in an effort to accurately analyze each pavement section based on its actual use and the type of aircraft that typically operates on it. Fleet Mix A includes all of the aircraft traffic operating at GSP, while Fleet Mix B includes all aircraft operating at GSP that are equal to or less than 100,000 pounds (max. takeoff weight of the aircraft). This step ensured that pavement sections that are not subject to commercial and military aircraft are not analyzed using these groups of aircraft. Additionally, runway and taxiway shoulders, as well as runway blast pads were not analyzed structurally as they are not subjected to the aircraft loads.

Table G.3 shows which pavement sections are associated with the two fleet mixes, and **Figure G.1** shows this information on an airfield map.

Since Greenville-Spartanburg International Airport (GSP) has one runway, all of the operations are assigned to each pavement section. Without knowledge of the specific uses for each Taxiway at GSP, this approach will produce somewhat conservative results. However, the

designs are far more sensitive to the aircraft weights than the number of departures, so this conservative estimate does not drastically alter the designs. To account for the growth of GSP and the projected increase in air traffic in the coming years, a 3% growth rate was applied to each aircraft's operations for the structural remaining life analysis.

Summary

Characterization of traffic operations is an essential component in the structural evaluation and design of airport pavements. The aircraft traffic mix and traffic on the pavement network at GSP was provided in the TFMSC Report from the FAA for October 2016 – September 2017. An alternate fleet mix was generated for pavement sections not subject to commercial and military aircraft traffic, while the full fleet mix was used for the remaining pavement sections. This section-level traffic information is used for determining the structural remaining life and PCN of the various pavement sections.

Greenville-Spartanburg International Airport Fleet Mix A		
Ref. No.	**Aircraft**	**Oct. 2016-Sep. 2017 Departures**
1	2DW 150000	2
2	2DW 400000	1
3	A300-600 std	61
4	A319-100 std	166
5	A320-200 Twin std	472
6	A321-200 std	9
7	A330-300 std	2
8	An-124	1
9	B707-320C	1
10	B717-200 HGW	775
11	B727-200C Basic	44
12	B737-200 LP	1
13	B737-300	395
14	B737-400	31
15	B737-700	665
16	B737-800	22
17	B737-900	5
18	B747-400ER Freighter	156
19	B757-200	738
20	B757-300	3
21	B767-200	6
22	B767-300	170
23	B777-200 ER	4
24	B787-8	2
25	C-130	10
26	C-17A	10
27	C-5	1
28	MD83	1502
29	MD90-30ER	88
30	DW 100000	3738
31	DW 150000	101
32	DW 200000	43
33	DW 50000	1471
34	DW 75000	7694
35	SW 30000	2031
36	SW 45000	5
37	SW 75000	8

Table G.1 – Fleet Mix A

Greenville-Spartanburg International Airport Fleet Mix B		
Ref. No.	**Aircraft**	**Oct. 2016-Sep. 2017 Departures**
1	DW 100000	3738
2	DW 50000	1471
3	DW 75000	7694
4	SW 30000	2031
5	SW 45000	5
6	SW 75000	8

Table G.2 – Fleet Mix B

Pavement Sections by Fleet Mix		
Fleet Mix A		**Fleet Mix B**
ACARGON-10	TWB-10	ACARGON-20
ACARGON-30	TWC-10	ACARGOS-20
ACARGOS-10	TWCARGO-10	AGEN-10
ATERM-10	TWD-10	AGEN-20
ATERM-20	TWE-5	AGEN-30
ATERM-30	TWE-10	AGEN-40
RW04-10	TWF-10	AITIN-10
RW04-20	TWG-10	AITIN-20
RW04-30	TWG-20	AITIN-30
RW04-40	TWJ-10	FS-10
RW04-50	TWK-10	FS-20
RW04-60	TWL-10	TL02-10
RW04-70	TWL-20	TL02-15
RW04-80	TWL-25	TL02-30
RW04-90	TWL-30	TWL5-10
RW04-100	TWL-40	TWL5-20
RW04-110	TWL2-10	TWL6-10
RW04-120	TWL2-20	
TL01-10	TWL2-30	
TL01-20	TWL3-10	
TL01-25	TWL3-20	
TL01-30	TWL4-10	
TWA-10	TWL4-20	

Table G.3 – Pavement Sections by Fleet Mix

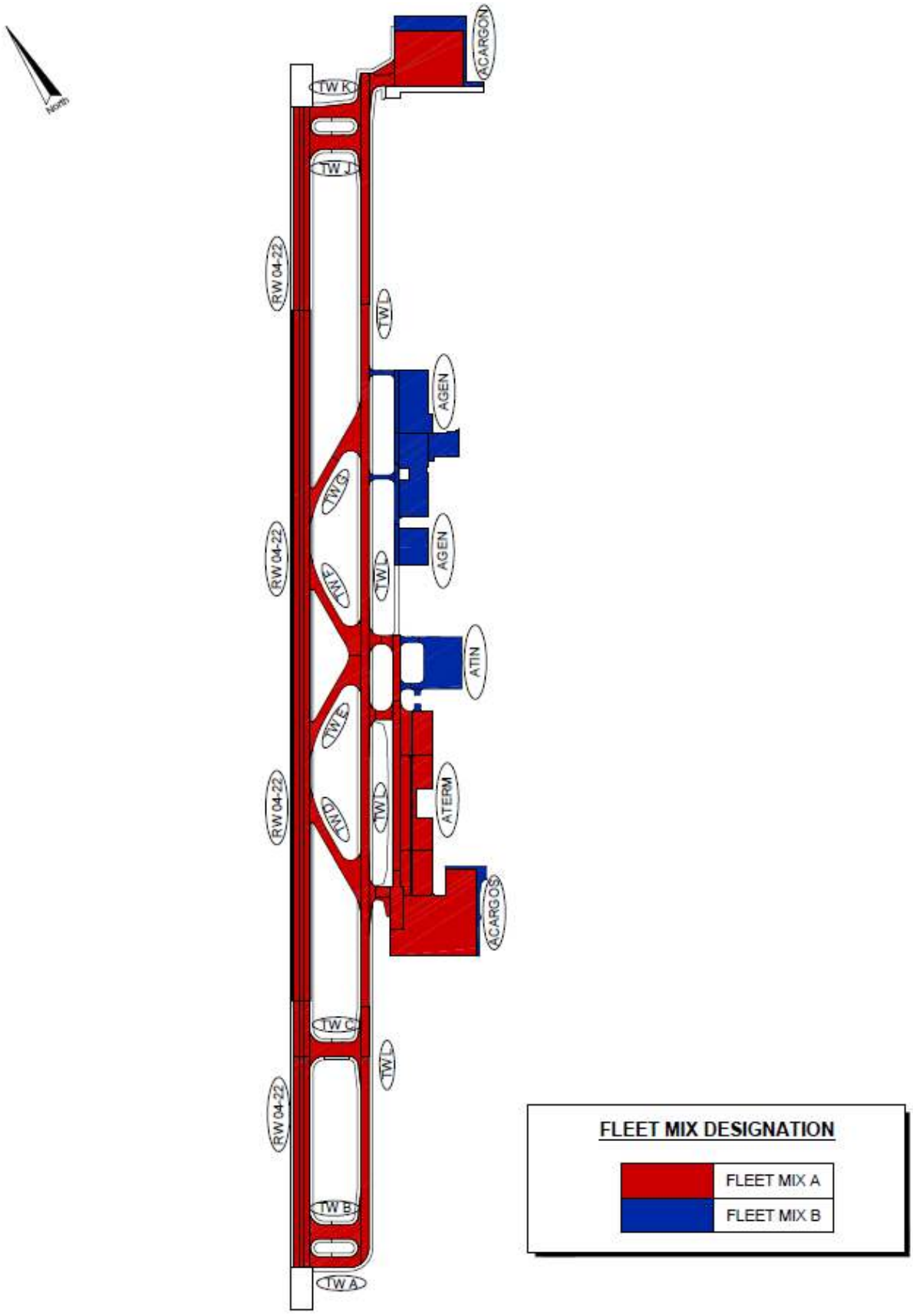


Figure G.1 – GSP Fleet Mix Designation

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX H: REMAINING LIFE DATA

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

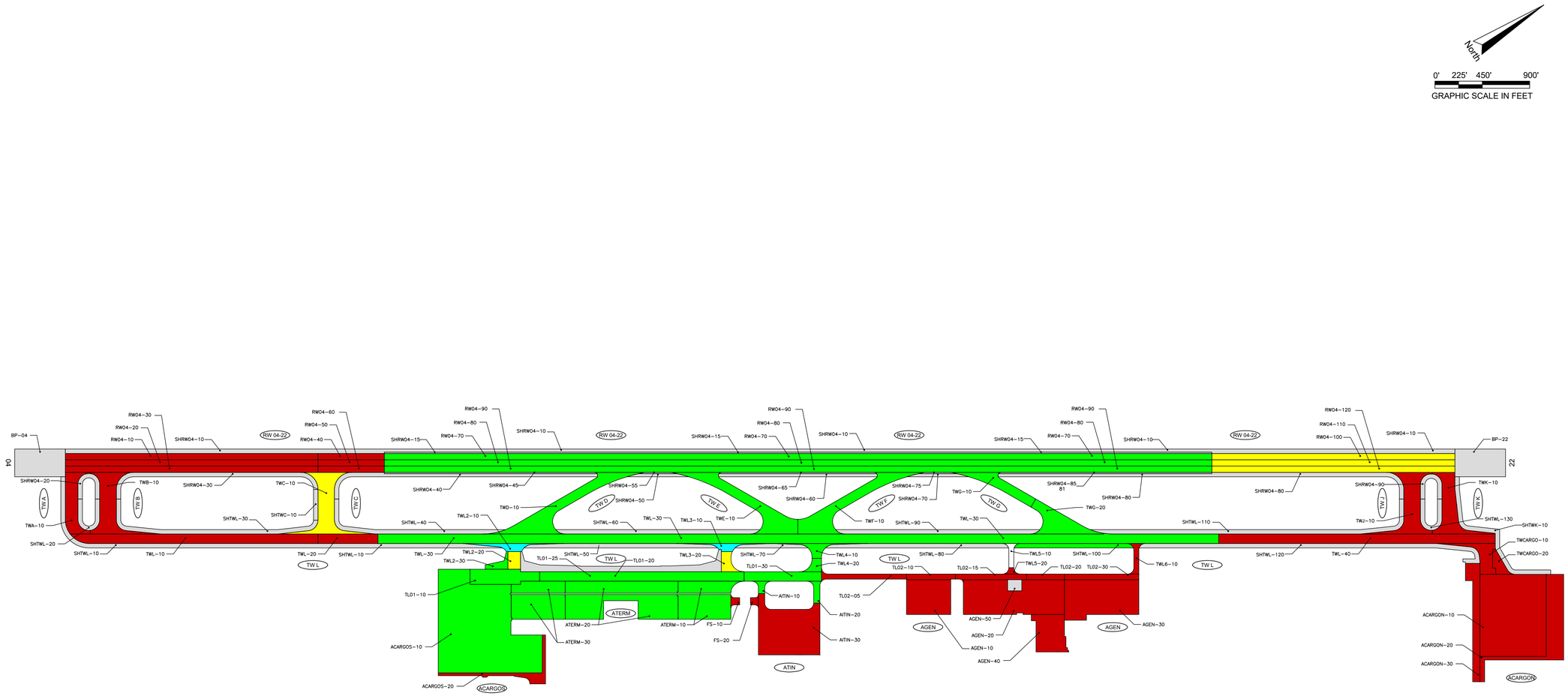
AVCON

Branch ID	Section ID	Surface Type	Fleet Mix	k/CBR Value	Structural Remaining Life (Years)
ACARGON	10	PCC	A	164.1	2.4
	20	PCC	B	164.1	0.3
	30	PCC	A	164.1	2.4
ACARGOS	10	PCC	A	340	20+
	20	PCC	B	340	0.5
AGEN	10	PCC	B	79	0
	20	PCC	B	196.4	0
	30	PCC	B	141.4	0
	40	PCC	B	84.8	0
AITIN	10	AAC	B	43.5	20+
	20	AAC	B	43.5	20+
	30	PCC	B	120.6	0
ATERM	10	PCC	A	292.3	20+
	20	PCC	A	292.3	20+
	30	PCC	A	292.3	20+
FS	10	PCC	B	120.6	0
	20	PCC	B	120.6	0
RW04	10	PCC	A	175.3	3.2
	20	PCC	A	175.3	3.2
	30	PCC	A	175.3	3.2
	40	PCC	A	175.3	3.2
	50	PCC	A	175.3	3.2
	60	PCC	A	175.3	3.2
	70	AAC	A	41.6	20+
	80	AAC	A	29.6	20+
	90	AAC	A	19.9	20+
	100	PCC	A	196.6	5
	110	PCC	A	196.6	5
	120	PCC	A	196.6	5
TL01	10	PCC	A	212.5	20+
	20	PCC	A	212.5	20+
	25	PCC	A	212.5	20+
	30	AAC	A	13.1	20+
TL02	10	PCC	B	73.1	0
	15	PCC	B	73.1	0.1
	30	PCC	B	73.1	0
TWA	10	PCC	A	178.3	3.4
TWB	10	PCC	A	141	1.4
TWC	10	PCC	A	224.3	8.7
TWCARGO	10	PCC	A	108.1	0.6
TWD	10	AAC	A	13	20+
TWE	5	AAC	A	16.6	20+
	10	AAC	A	9.6	20+
TWF	10	AAC	A	11.8	20+

Branch ID	Section ID	Surface Type	Fleet Mix	k/CBR Value	Structural Remaining Life (Years)
TWG	10	AAC	A	14	20+
	20	AAC	A	13	20+
TWJ	10	PCC	A	142.3	1.5
TWK	10	PCC	A	145.7	1.6
TWL	10	PCC	A	132.3	1.1
	20	PCC	A	132.3	1.1
	25	AAC	A	12.3	20+
	30	AAC	A	15.4	20+
	40	PCC	A	80	0.3
TWL2	10	AAC	A	5.6	11.3
	20	PCC	A	110.3	5.6
	30	PCC	A	110.3	20+
TWL3	10	AAC	A	6.1	18.4
	20	PCC	A	116.8	6.5
TWL4	10	AAC	A	7	20+
	20	AAC	A	7	20+
TWL5	10	AAC	B	5.2	20+
	20	PCC	B	106	0.2
TWL6	10	AC	B	2	0

Branch ID	Section ID	Surface Type	Fleet Mix	Last Major Rehabilitation	Age	PCI 2017	Critical PCI	Major Rehab. (years) (PCI=Critical)	Functional (years) (PCI ≤ 40)
ACARGON	10	PCC	A	1996	21	92	65	14	20+
	20	PCC	B	1996	21	97	65	16	20+
	30	PCC	A	2001	16	96	65	20+	20+
ACARGOS	10	PCC	A	2002	15	93	65	20+	20+
	20	PCC	B	2002	15	99	65	20+	20+
AGEN	10	PCC	B	2007	10	100	65	20+	20+
	20	PCC	B	1999	18	79	65	14	20+
	30	PCC	B	1984	33	100	65	18	20+
	40	PCC	B	2007	10	96	65	20+	20+
AITIN	10	AAC	B	2009	8	63	65	0	12
	20	AAC	B	2009	8	46	65	0	3
	30	PCC	B	2006	11	73	65	8	20+
ATERM	10	PCC	A	2017	0	100	65	20+	20+
	20	PCC	A	2017	0	99	65	20+	20+
	30	PCC	A	2017	0	100	65	20+	20+
FS	10	PCC	B	1963	54	92	65	14	20+
	20	PCC	B	1963	54	72	65	4	16
RW04	10	PCC	A	1999	18	100	70	20+	20+
	20	PCC	A	1999	18	99	70	20+	20+
	30	PCC	A	1996	21	100	70	15	20+
	40	PCC	A	1996	21	97	70	14	20+
	50	PCC	A	1996	21	100	70	15	20+
	60	PCC	A	1996	21	97	70	14	20+
	70	AAC	A	2009	8	84	70	7	20+
	80	AAC	A	2009	8	75	70	3	18
	90	AAC	A	2009	8	81	70	6	20+
	100	PCC	A	1996	21	98	70	14	20+
	110	PCC	A	1996	21	99	70	15	20+
	120	PCC	A	1996	21	95	70	13	20+
TL01	10	PCC	A	2001	16	97	65	20+	20+
	20	PCC	A	2001	16	97	65	20+	20+
	25	PCC	A	2016	1	96	65	20+	20+
	30	AAC	A	2009	8	48	65	0	4
TL02	10	PCC	B	2006	11	95	65	20+	20+
	15	PCC	B	2015	2	98	65	20+	20+
	30	PCC	B	1962	55	99	65	17	20+
TWA	10	PCC	A	1999	18	99	65	20+	20+
TWB	10	PCC	A	1999	18	99	65	20+	20+
TWC	10	PCC	A	1996	21	98	65	17	20+
TWCARGO	10	PCC	A	1996	21	92	65	14	20+
TWD	10	AAC	A	2010	7	68	65	2	14
TWE	5	AAC	A	2010	7	58	65	0	9
	10	AAC	A	2010	7	58	65	0	9
TWF	10	AAC	A	2010	7	49	65	0	5

Branch ID	Section ID	Surface Type	Fleet Mix	Last Major Rehabilitation	Age	PCI 2017	Critical PCI	Major Rehab. (years) (PCI=Critical)	Functional (years) (PCI ≤ 40)
TWG	10	AAC	A	2010	7	44	65	0	2
TWG	20	AAC	A	2016	1	100	65	18	20+
TWJ	10	PCC	A	1996	21	98	65	17	20+
TWK	10	PCC	A	1996	21	99	65	17	20+
TWL	10	PCC	A	1999	18	96	65	20+	20+
	20	PCC	A	1996	21	100	65	18	20+
	25	AAC	A	2010	7	61	65	0	11
	30	AAC	A	2010	7	61	65	0	11
TWL	40	PCC	A	1996	21	98	65	17	20+
TWL2	10	AAC	A	1994	23	70	65	2	10
	20	PCC	A	2001	16	94	65	20+	20+
	30	PCC	A	2016	1	98	65	20+	20+
TWL3	10	AAC	A	2009	8	69	65	2	15
	20	PCC	A	2001	16	95	65	20+	20+
TWL4	10	AAC	A	2009	8	75	65	5	18
	20	AAC	A	2009	8	71	65	3	16
TWL5	10	AAC	B	2009	8	76	65	6	18
	20	PCC	B	2015	2	100	65	20+	20+
TWL6	10	AC	B	2009	8	56	65	0	8



LEGEND

	0-5 YEARS
	6-10 YEARS
	11-20 YEARS
	20+ YEARS
	NOT ANALYZED

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

STRUCTURAL REMAINING LIFE

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

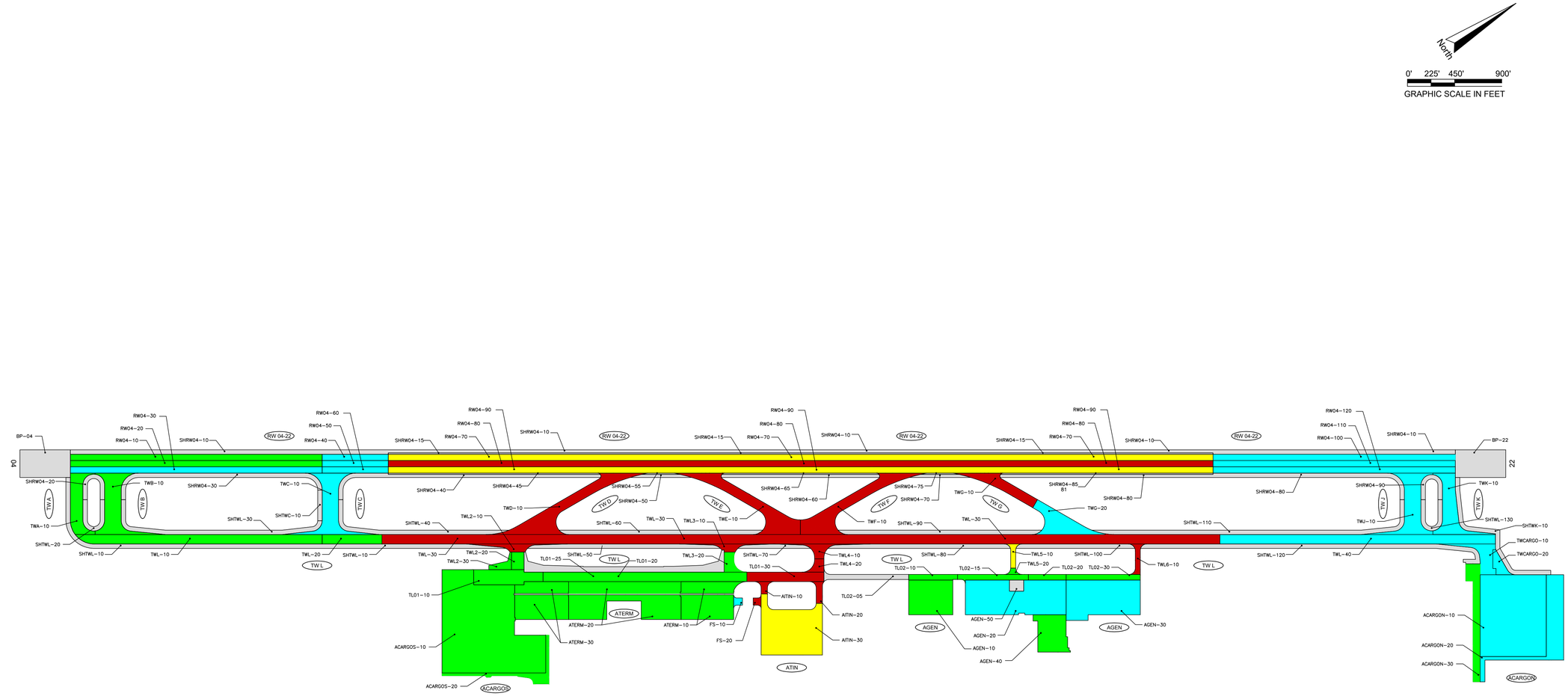
REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:	B.S.H.
DRAWN BY:	T.D.B.
CHECKED BY:	M.D.
APPROVED BY:	S.S.
DATE:	AUGUST 2018

AVCON PROJECT NO. 2017.266.01

APP. H-1



LEGEND

	0-5 YEARS
	6-10 YEARS
	11-20 YEARS
	20+ YEARS
	NOT ANALYZED

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

REMAINING LIFE TO CRITICAL PCI

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

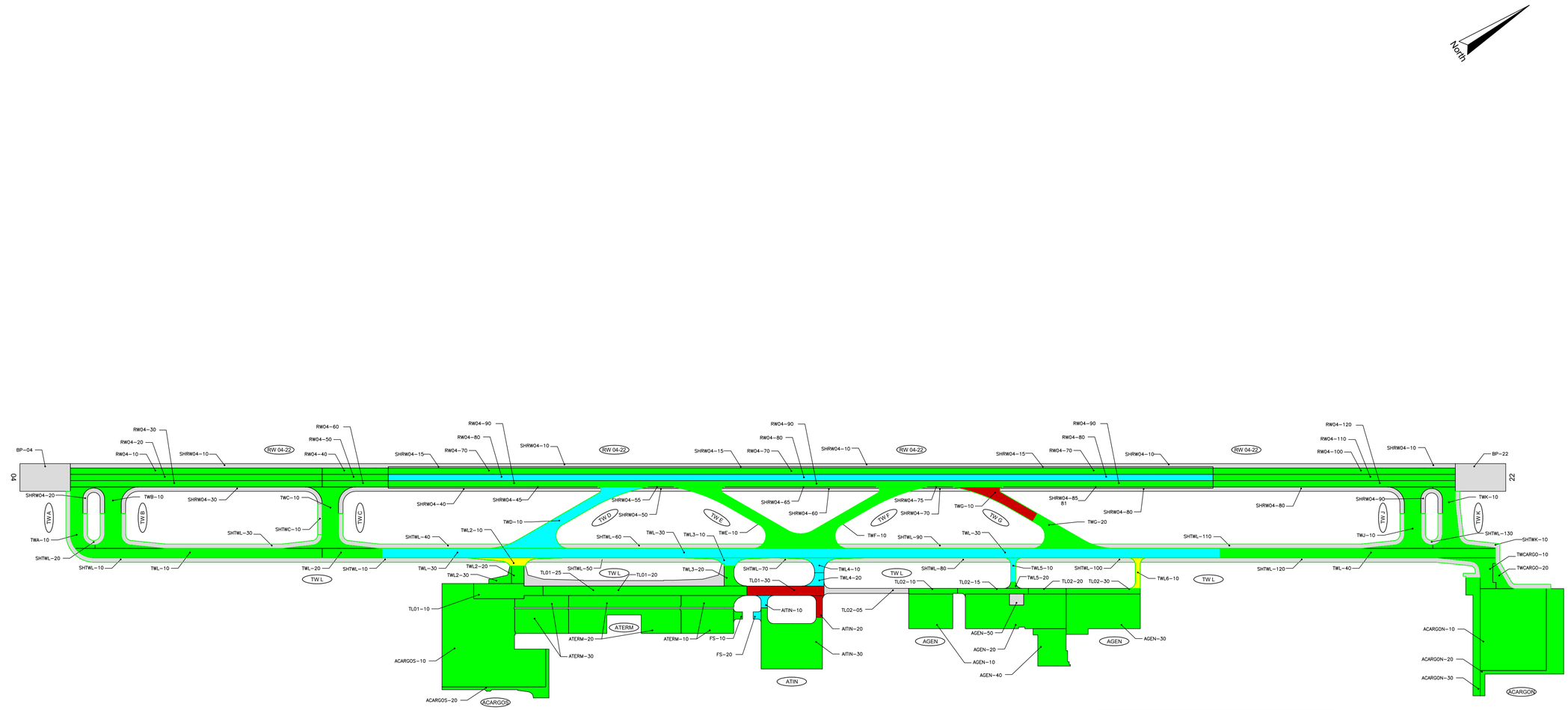
SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:	B.S.H.
DRAWN BY:	T.D.B.
CHECKED BY:	M.D.
APPROVED BY:	S.S.
DATE:	AUGUST 2018
AVCON PROJECT NO.	2017.266.01

APP. H-2



LEGEND

	0-5 YEARS
	6-10 YEARS
	11-20 YEARS
	20+ YEARS
	NOT ANALYZED

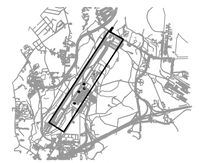
GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT



KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

FUNCTIONAL REMAINING LIFE (PCI = 40)

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:	B.S.H.
DRAWN BY:	T.D.B.
CHECKED BY:	M.D.
APPROVED BY:	S.S.
DATE:	AUGUST 2018

AVCON PROJECT NO. 2017.266.01

APP. H-3

V:\2017\2017.266.01 - GSP MASTER PLAN & PMP\2017.266.01 - PMP\CAD\1726601-GSP NETWORK-TDB-ORIG.DWG 8/22/2018

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX I: PCN/ACN DATA

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

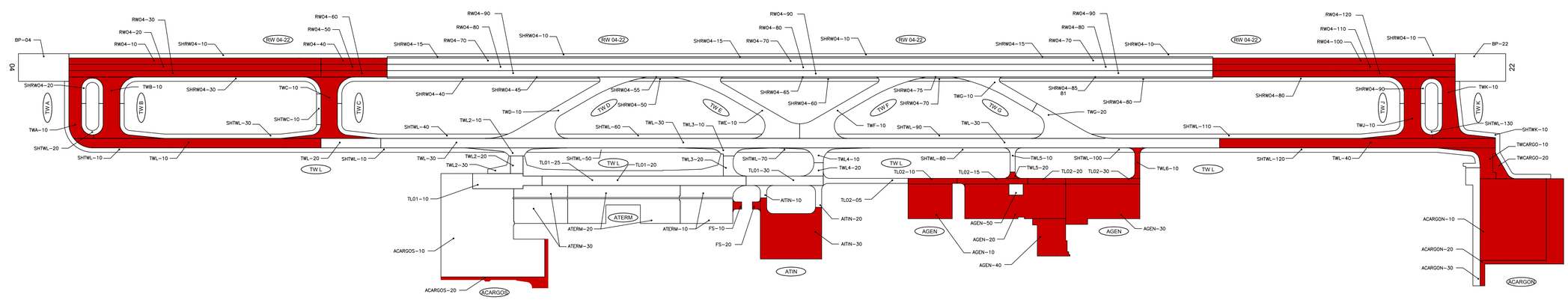
AVCON

Branch	Section	Section	Area (SqFt)	Geotech k or CBR Value	PCN Value	Weight or Traffic Restriction	PCN Code
ACARGON	10	14" P-501, 8" P-304	341,250	64.2	64	No	R/B/W/T
	20	8" P-501, 8" P-304	114,714	164.1	9	Yes	R/B/W/T
	30	14" P-501, 8" P-304	62,212	64.2	64	No	R/B/W/T
ACARGOS	10	15" P-501, 8" P-304	508,349	340	83	No	R/B/W/T
	20	8" P-501, 6" P-209	37,780	340	9	Yes	R/B/W/T
AGEN	10	6.5" P-501, 12" P-154	96,250	79	5	Yes	R/C/W/T
	20	6" P-501, 6" P-154	209,531	196.4	5	Yes	R/B/W/T
	30	7" P-501, 4" P-209	170,125	141.4	6	Yes	R/B/W/T
	40	6.5" P-501, 12" P-154	70,641	84.8	5	Yes	R/C/W/T
AITIN	10	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	5,974	43.5	588	No	F/A/X/T
	20	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	9,316	43.5	588	No	F/A/X/T
	30	6" P-501, 6" P-209	185,144	120.6	5	Yes	R/C/W/T
ATERM	10	17" P-501, 6" P-304, 6" P-209	123,677	292.3	107	No	R/B/W/T
	20	17" P-501, 6" P-304, 6" P-209	219,122	292.3	107	No	R/B/W/T
	30	17" P-501, 6" P-304, 6" P-209	122,490	292.3	107	No	R/B/W/T
FS	10	6" P-501	4,235	120.6	4	Yes	R/C/W/T
	20	6" P-501	3,841	120.6	4	Yes	R/C/W/T
RW04	10	14" P-501, 8" P-304	100,000	175.3	65	No	R/B/W/T
	20	14" P-501, 8" P-304	100,000	175.3	65	No	R/B/W/T
	30	14" P-501, 8" P-304	100,000	175.3	65	No	R/B/W/T
	40	14" P-501, 8" P-304	26,250	175.3	65	No	R/B/W/T
	50	14" P-501, 8" P-304	26,250	175.3	65	No	R/B/W/T
	60	14" P-501, 8" P-304	26,250	175.3	65	No	R/B/W/T
	70	3.5" P-401, 4" P-401, 2.5" P-401, 6" P-403, 12" P-154	327,500	41.6	1446	No	F/A/X/T
	80	3.5" P-401, 4" P-401, 2.5" P-401, 6" P-403, 12" P-154	327,500	29.6	789	No	F/A/X/T
	90	3.5" P-401, 4" P-401, 2.5" P-401, 6" P-403, 12" P-154	327,500	19.9	334	No	F/A/X/T
	100	14" P-501, 8" P-304	96,250	196.6	66	No	R/B/W/T
	110	14" P-501, 8" P-304	96,250	196.6	66	No	R/B/W/T
	120	14" P-501, 8" P-304	96,250	196.6	66	No	R/B/W/T
TL01	10	15" P-501, 8" P-304, 12" P-154	59,307	212.5	82	No	R/B/W/T
	20	15" P-501, 8" P-304, 12" P-154	121,425	212.5	82	No	R/B/W/T
	25	17" P-501, 6" P-304, 6" P-209	87,758	212.5	107	No	R/B/W/T
	30	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	45,956	13.1	250	No	F/A/X/T
TL02	10	6.5" P-501, 12" P-154	17,250	73.1	5	Yes	R/C/W/T
	15	10" P-501, 6" P-209, 12" P-154	25,193	73.1	15	Yes	R/C/W/T
	30	7" P-501, 4" P-209	26,550	73.1	6	Yes	R/C/W/T
TWA	10	14" P-501, 8" P-304	50,053	178.3	65	No	R/B/W/T
TWB	10	14" P-501, 8" P-304	81,551	141	63	No	R/B/W/T
TWC	10	14" P-501, 8" P-304	85,241	224.3	67	No	R/B/W/T
TWCARGO	10	14" P-501, 8" P-304	34,240	108.1	63	No	R/B/W/T
TWD	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	107,176	13	305	No	F/B/X/T
TWE	5	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	100,487	16.6	540	No	F/A/X/T
	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154		9.6	157	No	F/B/X/T
TWF	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	100,487	11.8	167	No	F/B/X/T
TWG	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	44,563	14	319	No	F/A/X/T
	20	7" P-401, 3" P-401, 6" P-403, 19.5" P-154	62,463	13	334	No	F/B/X/T
TWJ	10	14" P-501, 8" P-304	82,457	142.3	63	No	R/B/W/T
TWK	10	14" P-501, 8" P-304	70,383	145.7	63	No	R/B/W/T
TWL	10	14" P-501, 8" P-304	143,669	132.3	62	No	R/B/W/T
	20	14" P-501, 8" P-304	35,625	132.3	62	No	R/B/W/T
	25	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	-	12.3	261	No	F/B/X/T
	30	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	499,349	15.4	290	No	F/A/X/T
	40	14" P-501, 8" P-304	164,175	80	60	No	R/B/W/T
TWL2	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	16,854	5.6	101	No	F/C/X/T
	20	15" P-501, 8" P-304, 12" P-154	14,000	110.3	79	No	R/B/W/T
	30	17" P-501, 6" P-304, 6" P-209	11,126	110.3	97	No	R/B/W/T
TWL3	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	12,137	6.1	109	No	F/C/X/T
	20	15" P-501, 8" P-304, 12" P-154	14,681	116.8	79	No	R/B/W/T
TWL4	10	2" P-401, 4" P-401, 3" P-401, 6" P-403, 19.5" P-154	16,559	7	154	No	F/C/X/T
	20	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	10,098	7	120	No	F/C/X/T
TWL5	10	4" P-401, 3" P-401, 6" P-403, 19.5" P-154	8,754	5.2	30	Yes	F/C/X/T
	20	10" P-501, 6" P-209, 12" P-154	3,074	106	15	Yes	R/B/W/T
TWL6	10	4" P-401, 9" P-209	11,403	2	3	Yes	F/D/X/T

North

0' 225' 450' 900'

GRAPHIC SCALE IN FEET



CRITICAL PAVEMENT SECTIONS, PCN

CRITICAL SECTION

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

CRITICAL SECTIONS (PCN)

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:	B.S.H.
DRAWN BY:	T.D.B.
CHECKED BY:	M.D.
APPROVED BY:	S.S.
DATE:	AUGUST 2018
AVCON PROJECT NO.	2017.266.01

APP. I

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX J: AIRFIELD CIP MAPS AND DATA

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

Priority	Design Year	Construction Year	Project Description	Branch	Section	Pavement Type	2017 PCI	Section Area (SF)	Pavement Costs*	Rehabilitation Included	$/sq. foot	Non-Pavement Costs	Total Construction Costs	Professional Fees (25%)		Contingency (15%)	Total Project Cost
														Year 1 Design Fee (11% of Construction Cost)	Year 2 Construction Fee (14% of Construction Cost)		
1	2019	2020	Taxiway L & High Speed Taxiways Rehabilitation	SHTWC	10	AC	55	8,503	$ 22,178.66	2" Mill and Overlay	$ 2.61	$ 8,871.46	$ 7,844,390.69	$ 862,882.98	$ 1,098,214.70	$ 1,470,823.25	**$ 11,276,311.61**
				SHTWK	10	AC	66	46,553	$ 121,425.74	2" Mill and Overlay	$ 2.61	$ 48,570.30					
				SHTWL	10	AC	72	132,992	$ 346,887.47	2" Mill and Overlay	$ 2.61	$ 138,754.99					
				SHTWL	20	AC	75	18,920	$ 49,349.67	2" Mill and Overlay	$ 2.61	$ 19,739.87					
				SHTWL	30	AC	73	63,156	$ 164,731.90	2" Mill and Overlay	$ 2.61	$ 65,892.76					
				SHTWL	40	AC	58	51,836	$ 135,205.57	2" Mill and Overlay	$ 2.61	$ 54,082.23					
				SHTWL	50	AC	50	49,437	$ 128,948.18	2" Mill and Overlay	$ 2.61	$ 51,579.27					
				SHTWL	60	AC	63	55,000	$ 143,458.33	2" Mill and Overlay	$ 2.61	$ 57,383.33					
				SHTWL	70	AC	61	16,207	$ 42,273.26	2" Mill and Overlay	$ 2.61	$ 16,909.30					
				SHTWL	80	AC	46	48,179	$ 125,666.89	2" Mill and Overlay	$ 2.61	$ 50,266.76					
				SHTWL	90	AC	53	55,000	$ 143,458.33	2" Mill and Overlay	$ 2.61	$ 57,383.33					
				SHTWL	100	AC	41	32,100	$ 83,727.50	2" Mill and Overlay	$ 2.61	$ 33,491.00					
				SHTWL	110	AC	50	91,322	$ 238,198.22	2" Mill and Overlay	$ 2.61	$ 95,279.29					
				SHTWL	120	AC	48	99,512	$ 259,560.47	2" Mill and Overlay	$ 2.61	$ 103,824.19					
				SHTWL	130	AC	49	18,811	$ 49,065.36	2" Mill and Overlay	$ 2.61	$ 19,626.14					
				TWD	10	AAC	68	107,176	$ 535,284.58	4" Mill and Overlay	$ 4.99	$ 214,113.83					
				TWE	10	AAC	58	100,487	$ 334,956.67	Full Depth Asphalt Pavement Removal	$ 3.33	$ 133,982.67					
				TWF	10	AAC	49	100,487	$ 334,956.67	Full Depth Asphalt Pavement Removal	$ 3.33	$ 133,982.67					
				TWG	10	AAC	44	44,563	$ 222,567.43	4" Mill and Overlay	$ 4.99	$ 89,026.97					
				TWG	20	AAC	100	62,463	$ 311,967.98	4" Mill and Overlay	$ 4.99	$ 124,787.19					
				TWL	30	AAC	61	499,349	$ 1,302,468.64	2" Mill and Overlay	$ 2.61	$ 520,987.46					
				TWL2	10	AAC	70	16,854	$ 43,960.85	2" Mill and Overlay	$ 2.61	$ 17,584.34					
				TWL3	10	AAC	69	12,137	$ 31,657.34	2" Mill and Overlay	$ 2.61	$ 12,662.94					
				TWL4	10	AAC	75	16,559	$ 43,191.39	2" Mill and Overlay	$ 2.61	$ 17,276.56					
				TWL4	20	AAC	71	10,098	$ 26,338.95	2" Mill and Overlay	$ 2.61	$ 10,535.58					
				TWL5	10	AAC	76	8,754	$ 157,061.35	Full Depth Asphalt Pavement Reconstruction	$ 17.94	$ 62,824.54					
				TWL6	10	AAC	56	11,403	$ 204,588.83	Full Depth Asphalt Pavement Reconstruction	$ 17.94	$ 81,835.53					

Table J.1 - CIP Plan Details

Priority	Design Year	Construction Year	Project Description	Branch	Section	Pavement Type	2017 PCI	Section Area (SF)	Pavement Costs*	Rehabilitation Included	$/sq. foot	Non-Pavement Costs	Total Construction Costs	Professional Fees (25%)		Contingency (15%)	Total Project Cost
														Year 1 Design Fee (11% of Construction Cost)	Year 2 Construction Fee (14% of Construction Cost)		
2	2020	2021	Localized PCC Repairs and Joint Re-Seal - 3 Phases	ACARGOS	10	PCC	93	508,349	$ 406,679.20	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 81,335.84	$ 823,200.00	$ 90,552.00	$ 115,248.00	$ 154,350.00	**$ 1,183,350.00**
				ACARGOS	20	PCC	99	37,780	$ 30,224.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 6,044.80					
				TL01	10	PCC	97	59,307	$ 47,445.60	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 9,489.12					
				TL01	20	PCC	97	121,425	$ 97,140.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 19,428.00					
				TL01	25	PCC	96	87,758	$ 70,206.40	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 14,041.28					
				TWL2	20	PCC	94	14,000	$ 11,200.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 2,240.00					
				TWL2	30	PCC	98	11,126	$ 8,900.80	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 1,780.16					
				TWL3	20	PCC	95	14,681	$ 11,744.80	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 2,348.96					
				TWL5	20	PCC	100	3,074	$ 2,459.20	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 491.84					
				ACARGON	10	PCC	92	341,250	$ 273,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 54,600.00	$ 544,872.00	$ 59,935.92	$ 76,282.08	$ 102,163.50	**$ 783,253.50**
				ACARGON	20	PCC	97	114,714	$ 91,771.20	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 18,354.24					
				ACARGON	30	PCC	96	62,212	$ 49,769.60	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 9,953.92					
				TWCARGO	10	PCC	92	34,240	$ 27,392.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 5,478.40					
				TWCARGO	20	PCC	94	15,159	$ 12,127.20	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 2,425.44					
				AGEN	10	PCC	100	96,250	$ 77,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 15,400.00	$ 613,328.64	$ 67,466.15	$ 85,866.01	$ 114,999.12	**$ 881,659.92**
				AGEN	20	PCC	79	209,531	$ 167,624.80	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 33,524.96					
				AGEN	30	PCC	100	170,125	$ 136,100.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 27,220.00					
				AGEN	40	PCC	96	70,641	$ 56,512.80	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 11,302.56					
				AGEN	50	PCC	97	9,844	$ 7,875.20	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 1,575.04					
				TL02	10	PCC	95	17,250	$ 13,800.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 2,760.00					
				TL02	15	PCC	98	25,193	$ 20,154.40	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 4,030.88					
				TL02	20	PCC	77	13,500	$ 10,800.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 2,160.00					
				TL02	30	PCC	99	26,550	$ 21,240.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 4,248.00					

Table J.1 - CIP Plan Details (cont'd.)

Priority	Design Year	Construction Year	Project Description	Branch	Section	Pavement Type	2017 PCI	Section Area (SF)	Pavement Costs*	Rehabilitation Included	$/sq. foot	Non-Pavement Costs	Total Construction Costs	Professional Fees (25%)		Contingency (15%)	Total Project Cost
														Year 1 Design Fee (11% of Construction Cost)	Year 2 Construction Fee (14% of Construction Cost)		
3	2021	2022	Runway 04-22 Asphalt Pavement Rehabilitation	BP	04	AC	69	88,000	$ 229,533.33	2" Mill and Overlay	$ 2.61	$ 80,336.67	$ 6,688,934.81	$ 735,782.83	$ 936,450.87	$ 1,254,175.28	**$ 9,615,343.79**
				BP	22	AC	54	88,000	$ 229,533.33	2" Mill and Overlay	$ 2.61	$ 80,336.67					
				RW04	70	AAC	84	327,500	$ 854,229.17	2" Mill and Overlay	$ 2.61	$ 298,980.21					
				RW04	80	AAC	75	327,500	$ 854,229.17	2" Mill and Overlay	$ 2.61	$ 298,980.21					
				RW04	90	AAC	81	327,500	$ 854,229.17	2" Mill and Overlay	$ 2.61	$ 298,980.21					
				SHRW04	10	AC	63	319,525	$ 833,427.71	2" Mill and Overlay	$ 2.61	$ 291,699.70					
				SHRW04	15	AC	81	65,510	$ 170,871.92	2" Mill and Overlay	$ 2.61	$ 59,805.17					
				SHRW04	20	AC	89	15,741	$ 41,057.78	2" Mill and Overlay	$ 2.61	$ 14,370.22					
				SHRW04	30	AC	78	61,997	$ 161,708.84	2" Mill and Overlay	$ 2.61	$ 56,598.09					
				SHRW04	40	AC	67	60,404	$ 157,553.77	2" Mill and Overlay	$ 2.61	$ 55,143.82					
				SHRW04	45	AC	81	16,792	$ 43,799.13	2" Mill and Overlay	$ 2.61	$ 15,329.70					
				SHRW04	50	AC	70	10,047	$ 26,205.93	2" Mill and Overlay	$ 2.61	$ 9,172.07					
				SHRW04	55	AC	83	2,587	$ 6,747.76	2" Mill and Overlay	$ 2.61	$ 2,361.72					
				SHRW04	60	AC	70	31,379	$ 81,846.89	2" Mill and Overlay	$ 2.61	$ 28,646.41					
				SHRW04	65	AC	81	12,355	$ 32,225.96	2" Mill and Overlay	$ 2.61	$ 11,279.09					
				SHRW04	70	AC	70	10,047	$ 26,205.93	2" Mill and Overlay	$ 2.61	$ 9,172.07					
				SHRW04	75	AC	83	2,587	$ 6,747.76	2" Mill and Overlay	$ 2.61	$ 2,361.72					
				SHRW04	80	AC	53	99,881	$ 260,522.94	2" Mill and Overlay	$ 2.61	$ 91,183.03					
				SHRW04	85	AC	81	16,819	$ 43,869.56	2" Mill and Overlay	$ 2.61	$ 15,354.35					
				SHRW04	90	AC	65	15,420	$ 40,220.50	2" Mill and Overlay	$ 2.61	$ 14,077.18					

Table J.1 - CIP Plan Details (cont'd.)

Priority	Design Year	Construction Year	Project Description	Branch	Section	Pavement Type	2017 PCI	Section Area (SF)	Pavement Costs*	Rehabilitation Included	$/sq. foot	Non-Pavement Costs	Total Construction Costs	Professional Fees (25%)		Contingency (15%)	Total Project Cost
														Year 1 Design Fee (11% of Construction Cost)	Year 2 Construction Fee (14% of Construction Cost)		
4	2022	2023	Localized PCC Repairs and Joint Re-Seal	RW04	10	PCC	100	100,000	$ 80,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 26,400.00	$ 1,469,015.86	$ 161,591.74	$ 205,662.22	$ 275,440.47	**$ 2,111,710.29**
				RW04	20	PCC	99	100,000	$ 80,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 26,400.00					
				RW04	30	PCC	100	100,000	$ 80,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 26,400.00					
				RW04	40	PCC	97	26,250	$ 21,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 6,930.00					
				RW04	50	PCC	100	26,250	$ 21,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 6,930.00					
				RW04	60	PCC	97	26,250	$ 21,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 6,930.00					
				RW04	100	PCC	98	96,250	$ 77,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 25,410.00					
				RW04	110	PCC	99	96,250	$ 77,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 25,410.00					
				RW04	120	PCC	95	96,250	$ 77,000.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 25,410.00					
				TWA	10	PCC	99	50,053	$ 40,042.40	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 13,213.99					
				TWB	10	PCC	99	81,551	$ 65,240.80	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 21,529.46					
				TWC	10	PCC	98	85,241	$ 68,192.80	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 22,503.62					
				TWJ	10	PCC	98	82,457	$ 65,965.60	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 21,768.65					
				TWK	10	PCC	99	70,383	$ 56,306.40	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 18,581.11					
				TWL	10	PCC	96	143,669	$ 114,935.20	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 37,928.62					
				TWL	20	PCC	100	35,625	$ 28,500.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 9,405.00					
				TWL	40	PCC	98	164,175	$ 131,340.00	Localized Repairs and Rout, Clean and Seal Joints	$ 0.80	$ 43,342.20					

Table J.1 - CIP Plan Details (cont'd.)

Priority	Design Year	Construction Year	Project Description	Branch	Section	Pavement Type	2017 PCI	Section Area (SF)	Pavement Costs*	Rehabilitation Included	$/sq. foot	Non-Pavement Costs	Total Construction Costs	Professional Fees (25%)		Contingency (15%)	Total Project Cost
														Year 1 Design Fee (11% of Construction Cost)	Year 2 Construction Fee (14% of Construction Cost)		
5	2023	2024	Itinerant Apron Reconstruction	AITIN	10	AAC	63	5,974	$ 107,183.52	Full Depth Asphalt Pavement Reconstruction	$ 17.94	$ 32,155.06	$ 9,563,227.25	$ 1,051,955.00	$ 1,338,851.81	$ 1,793,105.11	**$ 13,747,139.16**
				AITIN	20	AAC	46	9,316	$ 167,144.57	Full Depth Asphalt Pavement Reconstruction	$ 17.94	$ 50,143.37					
				AITIN	30	PCC	73	185,144	$ 5,245,746.67	Full Depth PCC Pavement Reconstruction	$ 28.33	$ 1,573,724.00					
				FS	10	PCC	92	4,235	$ 119,991.67	Full Depth PCC Pavement Reconstruction	$ 28.33	$ 35,997.50					
				FS	20	PCC	72	3,841	$ 108,828.33	Full Depth PCC Pavement Reconstruction	$ 28.33	$ 32,648.50					
				TL01	30	AAC	48	45,956	$ 824,527.23	Full Depth Asphalt Pavement Reconstruction	$ 17.94	$ 247,358.17					
				TL02	05	PCC	33	27,632	$ 782,906.67	Full Depth PCC Pavement Reconstruction	$ 28.33	$ 234,872.00					

Table J.1 - CIP Plan Details (cont'd.)

Description	Work Unit	Unit Cost
AC Surface Course	TON	$ 175.00
Milling - 2"	SY	$ 3.00
Milling - 4"	SY	$ 4.00
10-inch Crushed Aggregate Base Course	SY	$ 40.00
15-inch Subbase	SY	$ 30.00
6-inch Subbase	SY	$ 15.00
8-inch Cement-Treated Base Course	SY	$ 40.00
Tack Coat	SY	$ 0.35
Prime Coat	SY	$ 0.40
12-inch PCC Pavement	SY	$ 150.00
PCC Pavement Removal	SY	$ 35.00
AC Pavement Removal	SY	$ 30.00
Locallized PCC Repairs (Including Joint Seal)	SF	$ 0.80

Table J.2 - Major Rehabilitation Unit Costs

PROPOSED RECONSTRUCTED PCC TAXIWAY/APRON STRUCTURE

Description	Work Unit	Unit Cost
12-inch PCC Pavement	SF	$ 16.67
8-inch Cement-Treated Base Course	SF	$ 4.44
15-inch Subbase	SF	$ 3.33
PCC Pavement Removal	SF	$ 3.89
	SF	**$ 28.33**

PROPOSED RECONSTRUCTED ASPHALT TAXIWAY STRUCTURE

Description	Work Unit	Unit Cost
6-inch AC Surface Course	SF	$ 6.71
Tack Coat	SF	$ 0.08
Prime Coat	SF	$ 0.04
10-inch Crushed Aggregate Base Course	SF	$ 4.44
15-inch Subbase	SF	$ 3.33
AC Pavement Removal	SF	$ 3.33
	SF	**$ 17.94**

PROPOSED RECONSTRUCTED ASPHALT TAXIWAY SHOULDER STRUCTURE

Description	Work Unit	Unit Cost
3-inch AC Surface Course	SF	$ 3.35
Tack Coat	SF	$ 0.04
Prime Coat	SF	$ 0.04
10-inch Crushed Aggregate Base Course	SF	$ 4.44
6-inch Subbase	SF	$ 1.67
AC Pavement Removal	SF	$ 3.33
	SF	**$ 12.88**

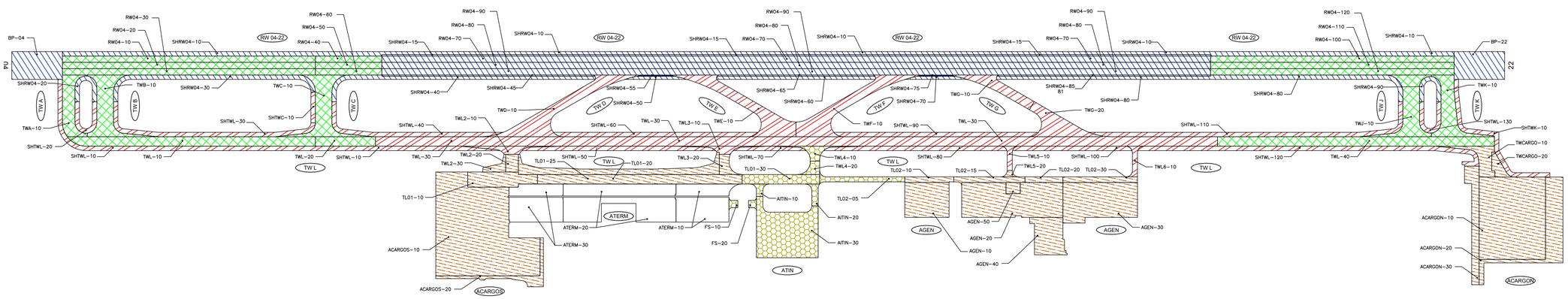
PROPOSED 2" ASPHALT MILL AND OVERLAY REHABILITATION

Description	Work Unit	Unit Cost
2-inch AC Surface Course	SF	$ 2.24
Tack Coat	SF	$ 0.04
Milling - 2"	SF	$ 0.33
	SF	**$ 2.61**

PROPOSED 4" ASPHALT MILL AND OVERLAY REHABILITATION

Description	Work Unit	Unit Cost
4-inch AC Surface Course	SF	$ 4.47
Tack Coat	SF	$ 0.08
Milling - 4"	SF	$ 0.44
	SF	**$ 4.99**

Table J.3 - Proposed Rehabilitation Pavement Structures



AIRFIELD CAPITAL IMPROVEMENT PLAN 2019-2024

	DESIGN YEAR	CONSTRUCTION YEAR	TOTAL PROJECT COST
	2019	2020	PROJECT 1 $7,990,000
	2020	2021	PROJECT 2 $7,240,000
	2021	2022	PROJECT 3 $8,210,000
	2022	2023	PROJECT 4 $2,090,000
	2023	2024	PROJECT 5 $5,615,000

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

AVCON

AVCON, INC.
ENGINEERS & PLANNERS
5555 E. MICHIGAN ST., SUITE 200 - ORLANDO, FL 32822-2779
OFFICE: (407) 599-1122 - FAX: (407) 599-1133
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MIKE DARCANGELO, P.E.
SOUTH CAROLINA LIC. No. XXXXX

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

KEY PLAN

PAVEMENT MANAGEMENT PLAN (PMP) UPDATE

CAPITAL IMPROVEMENT PLAN (CIP) MAP

ATTENTION:
THIS DOCUMENT CONTAINS PRIVILEGED AND PROPRIETARY INFORMATION, ALL OF WHICH IS EXPRESSLY PROVIDED BY AVCON, INC., FOR USE BY THE INTENDED RECIPIENT, AND FOR A SPECIFIC PURPOSE. WITHOUT THE EXPRESS WRITTEN CONSENT OF AVCON, INC. ANY DISTRIBUTION, REPRODUCTION, OR OTHER USE OF THIS DOCUMENT, IN WHOLE OR IN PART, IS STRICTLY PROHIBITED

SCALE: AS NOTED

REVISIONS:

NO.	DATE	BY	DESCRIPTION

DESIGNED BY:	B.S.H.
DRAWN BY:	T.D.B.
CHECKED BY:	M.D.
APPROVED BY:	S.S.
DATE:	AUGUST 2018
AVCON PROJECT NO.	2017.266.01

APP. J

GSP INTERNATIONAL AIRPORT
ROGER MILLIKEN FIELD

APPENDIX K: MAINTENANCE PLAN AND SUMMARY

AIRPORT PAVEMENT MANAGEMENT SYSTEM UPDATE

AVCON

APPENDIX K – MAINTENANCE PLAN AND SUMMARY

Overview

Pavement distress related maintenance activity plays a crucial role in the asset preservation and performance of overall airfield operations. The use of Capital Improvement Program (CIP) planning and execution, in addition to routine maintenance, allows planners of different departments and agencies the budgetary information and physical data in order to make informative airfield decisions, especially when funding is limited. This Appendix describes the development of the Maintenance Plan proposed as a supplement to the CIP proposed in **Chapter 6**. This maintenance plan describes specific maintenance issues to be addressed that will prolong the life of the pavement until a major rehabilitation project is undertaken.

Prioritization of Pavement Projects

MicroPAVER allows the user to determine the prioritization of the Major Maintenance and Rehabilitation work. **Table K.1** outlines the prioritization rule established for the Greenville-Spartanburg International Airport. These rules are based on pavement use and condition of pavement from the 2017 pavement condition inspections.

Branch Use	Priority
Runway	High
Taxiway	Medium
Apron	Low
Shoulders	Low
Blast Pads	Low

Table K.1 – Branch Use Priority Table

Summary of Methodology: Creation of Maintenance Plan

MicroPAVER was utilized to formulate a list of areas requiring localized attention based on the observed distresses during the 2017 GSP PMP pavement inspection process.

Since less than 25% of the airfield was actually surveyed, MicroPAVER formulated a method to estimate the quantities of distresses on the entire airfield for conceptual planning purposes. The distress quantity, as listed in the Maintenance Plan, is the predicted amount of distresses expected within the entire pavement section. These values were extrapolated based on the observed quantity of distresses within surveyed sample units and the area of the section. The accuracy of the predicted work quantity is subjective not only in regards to the percentage of surveyed area with respect to total section area but also in the concentration of distress within a surveyed sample unit. Even though ASTM sampling methods were utilized, few select instances represent very conservative, often unrealistic, values for the predicted work quantity. The data from the 2017 pavement condition inspections was extrapolated at the section level to determine the approximate number of distresses in a given section, and subsequently a pavement branch. The Maintenance Plan simply provides loose budgetary estimates for planning purposes.

The Maintenance Plan is important to the conservation of the Airport's success and should not be overlooked. A solid maintenance plan prevents more costly pavement repairs towards the end of a pavement's expected life cycle. The proposed Maintenance Plan provided, in conjunction with the proposed CIP Plan, serves as a solid planning tool in maintaining GSP as a leader in the airport industry.

Distress Type	Severity	Work Type Description
Bleeding	n/a	Monitor
Block Cracking	H	Crack Seal
	M	Crack Seal
	L	Monitor
L&T Cracking	H	Crack Seal
	M	Crack Seal
	L	Monitor
Oil Spillage	n/a	AC Patch (Partial Depth)
Patching	H	AC Patch (Full Depth)
	M	AC Patch (Full Depth)
	L	Monitor
Rutting	H	AC Patch (Full Depth)
	M	AC Patch (Full Depth)
	L	Monitor
Slippage Cracking	n/a	AC Patch (Full Depth)
Swelling	H	AC Patch (Full Depth)
	M	Monitor
	L	Monitor
Weathering	H	AC Patch (Partial Depth)
	M	AC Patch (Partial Depth)
	L	Monitor

Table K.2 – AC Pavement Distresses & Maintenance

Distress Type	Severity	Work Type Description
Corner Break	H	PCC Patch (Full Depth)
	M	PCC Patch (Full Depth)
	L	Crack Seal
LTD Cracking	H	PCC Patch (Full Depth)
	M	Crack Seal
	L	Monitor
Joint Seal Damage	H	Joint Seal
	M	Joint Seal
	L	Monitor
Patching	H	PCC Patch (Full Depth)
	M	Monitor
	L	Monitor
Scaling	H	Slab Replacement
	M	Monitor
	L	Monitor
Shattered Slab	H	Slab Replacement
	M	Slab Replacement
	L	Monitor
Shrinkage Cracking	n/a	Monitor
Spalling (Joint & Corner)	H	PCC Patch (Full Depth)
	M	PCC Patch (Full Depth)
	L	Monitor

Table K.3 – PCC Pavement Distresses & Maintenance

Repair Policy Description	Work Unit	Unit Cost
Joint Seal	LF	$ 5.00
Slab Replacement	SF	$ 100.00
Full-Depth PCC Patch	SF	$ 40.00
Crack Sealing - PCC	LF	$ 5.00
Crack Sealing - AC	LF	$ 4.00
Patching - AC Partial Depth	SF	$ 6.00
Patching - AC Full Depth	SF	$ 20.00

Table K.4 – Pavement Repair Unit Costs

Branch ID	Section ID	Description	Severity	Quantity	Work Description	Work Quantity	Unit	Unit Cost	Estimated Construction Cost	Professional Fees (25%)	Contingency (15%)	Estimated Total Project Cost
ACARGON	10	Joint Spall	Medium	2	Full Depth Patch	30	SF	$ 40.00	$ 1,200.00	$ 300.00	$ 225.00	$ 1,725.00
		Corner Spall	Medium	1	Full Depth Patch	15	SF	$ 40.00	$ 600.00	$ 150.00	$ 112.50	$ 862.50
AITIN	30	Joint Spall	Medium	2	Full Depth Patch	30	SF	$ 40.00	$ 1,200.00	$ 300.00	$ 225.00	$ 1,725.00
		Corner Spall	Medium	2	Full Depth Patch	30	SF	$ 40.00	$ 1,200.00	$ 300.00	$ 225.00	$ 1,725.00
		Corner Break	Medium	11	Full Depth Patch	1350	SF	$ 40.00	$ 54,000.00	$ 13,500.00	$ 10,125.00	$ 77,625.00
		Corner Break	High	3	Full Depth Patch	375	SF	$ 40.00	$ 15,000.00	$ 3,750.00	$ 2,812.50	$ 21,562.50
		Shattered Slab	Medium	1	Slab Replacement	1000	SF	$ 100.00	$ 100,000.00	$ 25,000.00	$ 18,750.00	$ 143,750.00
AGEN	20	Joint Spall	Medium	4	Full Depth Patch	54	SF	$ 40.00	$ 2,160.00	$ 540.00	$ 405.00	$ 3,105.00
		Joint Spall	High	1	Full Depth Patch	15	SF	$ 40.00	$ 600.00	$ 150.00	$ 112.50	$ 862.50
		Corner Spall	Medium	5	Full Depth Patch	69	SF	$ 40.00	$ 2,760.00	$ 690.00	$ 517.50	$ 3,967.50
		Corner Spall	High	1	Full Depth Patch	15	SF	$ 40.00	$ 600.00	$ 150.00	$ 112.50	$ 862.50
		Corner Break	High	1	Full Depth Patch	125	SF	$ 40.00	$ 5,000.00	$ 1,250.00	$ 937.50	$ 7,187.50
		LTD Crack	Medium	1	Crack Seal	75	LF	$ 4.00	$ 300.00	$ 75.00	$ 56.25	$ 431.25
		LTD Crack	High	1	Full Depth Patch	75	LF	$ 40.00	$ 3,000.00	$ 750.00	$ 562.50	$ 4,312.50
ACARGOS	10	Joint Spall	Medium	2	Full Depth Patch	30	SF	$ 40.00	$ 1,200.00	$ 300.00	$ 225.00	$ 1,725.00
FS	20	Corner Break	High	1	Full Depth Patch	50	SF	$ 40.00	$ 2,000.00	$ 500.00	$ 375.00	$ 2,875.00
AGEN	50	Corner Spall	High	1	Full Depth Patch	6	SF	$ 40.00	$ 240.00	$ 60.00	$ 45.00	$ 345.00
TL01	20	Corner Break	Medium	1	Full Depth Patch	50	SF	$ 40.00	$ 2,000.00	$ 500.00	$ 375.00	$ 2,875.00
TWL2	20	Joint Spall	Medium	1	Full Depth Patch	9	SF	$ 40.00	$ 360.00	$ 90.00	$ 67.50	$ 517.50
Total									**$ 193,420.00**			**$ 278,041.25**

Table K.5 - PCC Maintenance

Branch ID	Section ID	Description	Severity	Quantity	Work Description	Work Quantity	Unit	Unit Cost	Estimated Construction Cost	Professional Fees (25%)	Contingency (15%)	Estimated Total Project Cost
BP	04	Weathering	Medium	400	AC Patch (Partial Depth)	1067	SF	$ 6.00	$ 6,402.00	$ 1,600.50	$ 1,200.38	$ 9,202.88
		LT Cracking	Medium	65	Crack Seal	173	LF	$ 4.00	$ 692.00	$ 173.00	$ 129.75	$ 994.75
BP	22	LT Cracking	Medium	1350	Crack Seal	3600	LF	$ 4.00	$ 14,400.00	$ 3,600.00	$ 2,700.00	$ 20,700.00
		LT Cracking	High	165	Crack Seal	440	LF	$ 4.00	$ 1,760.00	$ 440.00	$ 330.00	$ 2,530.00
TWA	10	Weathering	Medium	125	AC Patch (Partial Depth)	250	SF	$ 6.00	$ 1,500.00	$ 375.00	$ 281.25	$ 2,156.25
TWD	10	LT Cracking	Medium	30	Crack Seal	113	LF	$ 4.00	$ 452.00	$ 113.00	$ 84.75	$ 649.75
TWE	10	LT Cracking	Medium	40	Crack Seal	136	LF	$ 4.00	$ 544.00	$ 136.00	$ 102.00	$ 782.00
TWF	10	LT Cracking	Medium	525	Crack Seal	1785	LF	$ 4.00	$ 7,140.00	$ 1,785.00	$ 1,338.75	$ 10,263.75
TWG	10	LT Cracking	Medium	100	Crack Seal	300	LF	$ 4.00	$ 1,200.00	$ 300.00	$ 225.00	$ 1,725.00
		LT Cracking	High	25	Crack Seal	75	LF	$ 4.00	$ 300.00	$ 75.00	$ 56.25	$ 431.25
SHRW04	10	Weathering	Medium	500	AC Patch (Partial Depth)	3500	SF	$ 6.00	$ 21,000.00	$ 5,250.00	$ 3,937.50	$ 30,187.50
		LT Cracking	Medium	500	Crack Seal	3500	LF	$ 4.00	$ 14,000.00	$ 3,500.00	$ 2,625.00	$ 20,125.00
		LT Cracking	High	390	Crack Seal	2730	LF	$ 4.00	$ 10,920.00	$ 2,730.00	$ 2,047.50	$ 15,697.50
SHRW04	30	Weathering	Medium	525	AC Patch (Partial Depth)	1313	SF	$ 6.00	$ 7,878.00	$ 1,969.50	$ 1,477.13	$ 11,324.63
SHRW04	40	Weathering	Medium	800	AC Patch (Partial Depth)	1733	SF	$ 6.00	$ 10,398.00	$ 2,599.50	$ 1,949.63	$ 14,947.13
		LT Cracking	Medium	110	Crack Seal	238	LF	$ 4.00	$ 952.00	$ 238.00	$ 178.50	$ 1,368.50
SHRW04	80	Weathering	Medium	350	AC Patch (Partial Depth)	1108	SF	$ 6.00	$ 6,648.00	$ 1,662.00	$ 1,246.50	$ 9,556.50
		LT Cracking	Medium	900	Crack Seal	2850	LF	$ 4.00	$ 11,400.00	$ 2,850.00	$ 2,137.50	$ 16,387.50
		LT Cracking	High	450	Crack Seal	1425	LF	$ 4.00	$ 5,700.00	$ 1,425.00	$ 1,068.75	$ 8,193.75
SHRW04	90	LT Cracking	Medium	125	Crack Seal	250	LF	$ 4.00	$ 1,000.00	$ 250.00	$ 187.50	$ 1,437.50
		LT Cracking	High	90	Crack Seal	180	LF	$ 4.00	$ 720.00	$ 180.00	$ 135.00	$ 1,035.00
SHTWL	10	Weathering	Medium	140	AC Patch (Partial Depth)	440	SF	$ 6.00	$ 2,640.00	$ 660.00	$ 495.00	$ 3,795.00
SHTWL	30	Weathering	Medium	145	AC Patch (Partial Depth)	399	SF	$ 6.00	$ 2,394.00	$ 598.50	$ 448.88	$ 3,441.38
SHTWL	40	Weathering	Medium	600	AC Patch (Partial Depth)	1560	SF	$ 6.00	$ 9,360.00	$ 2,340.00	$ 1,755.00	$ 13,455.00
		LT Cracking	Medium	30	Crack Seal	78	LF	$ 4.00	$ 312.00	$ 78.00	$ 58.50	$ 448.50
		LT Cracking	High	375	Crack Seal	975	LF	$ 4.00	$ 3,900.00	$ 975.00	$ 731.25	$ 5,606.25
SHTWL	50	LT Cracking	Medium	150	Crack Seal	400	LF	$ 4.00	$ 1,600.00	$ 400.00	$ 300.00	$ 2,300.00
		LT Cracking	High	150	Crack Seal	400	LF	$ 4.00	$ 1,600.00	$ 400.00	$ 300.00	$ 2,300.00
SHTWL	60	Weathering	Medium	1850	AC Patch (Partial Depth)	6167	SF	$ 6.00	$ 37,002.00	$ 9,250.50	$ 6,937.88	$ 53,190.38
SHTWL	70	Weathering	Medium	100	AC Patch (Partial Depth)	150	SF	$ 6.00	$ 900.00	$ 225.00	$ 168.75	$ 1,293.75
		LT Cracking	Medium	100	Crack Seal	150	LF	$ 4.00	$ 600.00	$ 150.00	$ 112.50	$ 862.50
SHTWL	80	Weathering	Medium	200	AC Patch (Partial Depth)	533	SF	$ 6.00	$ 3,198.00	$ 799.50	$ 599.63	$ 4,597.13
		LT Cracking	Medium	650	Crack Seal	1733	LF	$ 4.00	$ 6,932.00	$ 1,733.00	$ 1,299.75	$ 9,964.75
		LT Cracking	High	275	Crack Seal	733	LF	$ 4.00	$ 2,932.00	$ 733.00	$ 549.75	$ 4,214.75
SHTWL	90	Weathering	Medium	500	AC Patch (Partial Depth)	1667	SF	$ 6.00	$ 10,002.00	$ 2,500.50	$ 1,875.38	$ 14,377.88
		LT Cracking	Medium	650	Crack Seal	2167	LF	$ 4.00	$ 8,668.00	$ 2,167.00	$ 1,625.25	$ 12,460.25
		LT Cracking	High	275	Crack Seal	917	LF	$ 4.00	$ 3,668.00	$ 917.00	$ 687.75	$ 5,272.75
SHTWL	100	Weathering	Medium	200	AC Patch (Partial Depth)	600	SF	$ 6.00	$ 3,600.00	$ 900.00	$ 675.00	$ 5,175.00
		LT Cracking	Medium	1300	Crack Seal	3900	LF	$ 4.00	$ 15,600.00	$ 3,900.00	$ 2,925.00	$ 22,425.00
		LT Cracking	High	300	Crack Seal	900	LF	$ 4.00	$ 3,600.00	$ 900.00	$ 675.00	$ 5,175.00
SHTWL	110	LT Cracking	Medium	550	Crack Seal	1650	LF	$ 4.00	$ 6,600.00	$ 1,650.00	$ 1,237.50	$ 9,487.50
		LT Cracking	High	300	Crack Seal	900	LF	$ 4.00	$ 3,600.00	$ 900.00	$ 675.00	$ 5,175.00
SHTWL	120	Block Cracking	Medium	100	Crack Seal	320	LF	$ 4.00	$ 1,280.00	$ 320.00	$ 240.00	$ 1,840.00
		LT Cracking	Medium	750	Crack Seal	2400	LF	$ 4.00	$ 9,600.00	$ 2,400.00	$ 1,800.00	$ 13,800.00
		LT Cracking	High	500	Crack Seal	1600	LF	$ 4.00	$ 6,400.00	$ 1,600.00	$ 1,200.00	$ 9,200.00
SHTWL	130	LT Cracking	Medium	675	Crack Seal	1350	LF	$ 4.00	$ 5,400.00	$ 1,350.00	$ 1,012.50	$ 7,762.50
		LT Cracking	High	250	Crack Seal	500	LF	$ 4.00	$ 2,000.00	$ 500.00	$ 375.00	$ 2,875.00
SHTWC	10	Block Cracking	High	120	Crack Seal	240	LF	$ 4.00	$ 960.00	$ 240.00	$ 180.00	$ 1,380.00
SHTWK	10	Weathering	Medium	100	AC Patch (Partial Depth)	267	SF	$ 6.00	$ 1,602.00	$ 400.50	$ 300.38	$ 2,302.88

Table K.6 - AC Maintenance

Branch ID	Section ID	Description	Severity	Quantity	Work Description	Work Quantity	Unit	Unit Cost	Estimated Construction Cost	Professional Fees (25%)	Contingency (15%)	Estimated Total Project Cost
SHTWK	10	LT Cracking	Medium	60	Crack Seal	160	LF	$ 4.00	$ 640.00	$ 160.00	$ 120.00	$ 920.00
		LT Cracking	High	200	Crack Seal	533	LF	$ 4.00	$ 2,132.00	$ 533.00	$ 399.75	$ 3,064.75
TWL	30	LT Cracking	Medium	1115	Crack Seal	5513	LF	$ 4.00	$ 22,052.00	$ 5,513.00	$ 4,134.75	$ 31,699.75
TWL2	10	LT Cracking	Medium	15	Crack Seal	45	LF	$ 4.00	$ 180.00	$ 45.00	$ 33.75	$ 258.75
TL02	10	Block Cracking	Medium	7500	Crack Seal	18750	LF	$ 4.00	$ 75,000.00	$ 18,750.00	$ 14,062.50	$ 107,812.50
		Block Cracking	High	300	Crack Seal	750	LF	$ 4.00	$ 3,000.00	$ 750.00	$ 562.50	$ 4,312.50
AITIN	10	LT Cracking	Medium	50	Crack Seal	50	LF	$ 4.00	$ 200.00	$ 50.00	$ 37.50	$ 287.50
AITIN	20	LT Cracking	Medium	60	Crack Seal	120	LF	$ 4.00	$ 480.00	$ 120.00	$ 90.00	$ 690.00
TL01	30	LT Cracking	Medium	500	Crack Seal	1333	LF	$ 4.00	$ 5,332.00	$ 1,333.00	$ 999.75	$ 7,664.75
		LT Cracking	High	25	Crack Seal	67	LF	$ 4.00	$ 268.00	$ 67.00	$ 50.25	$ 385.25
TWL6	10	LT Cracking	Medium	50	Crack Seal	100	LF	$ 4.00	$ 400.00	$ 100.00	$ 75.00	$ 575.00
Total									**$ 390,640.00**			**$ 561,545.00**

Table K.6 - AC Maintenance (cont'd.)

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE
APPENDIX B: TRAFFIC COUNT REPORT

McFarland Johnson

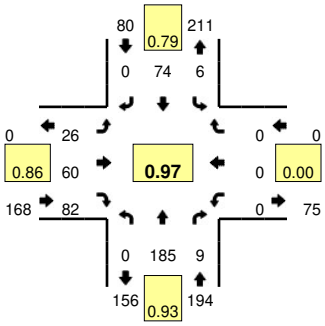
Type of peak hour being reported: Intersection Peak

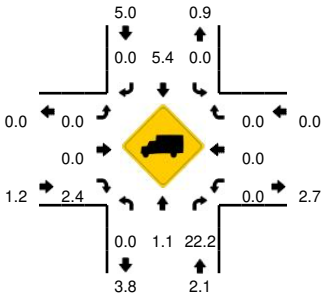
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Rental Car Dwy
CITY/STATE: Greer, SC

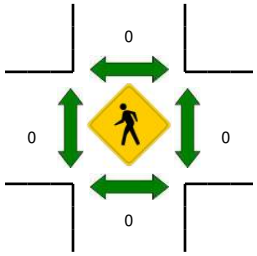
QC JOB #: 14557201
DATE: Tue, Nov 14 2017

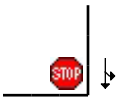
Peak-Hour: 8:45 AM -- 9:45 AM
Peak 15-Min: 9:30 AM -- 9:45 AM

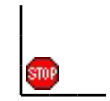


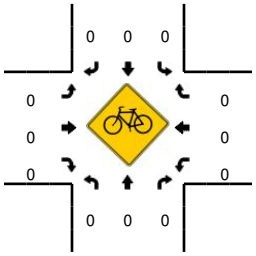


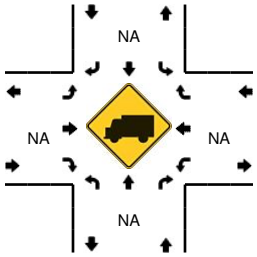
Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES

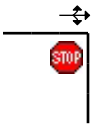


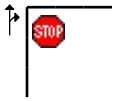


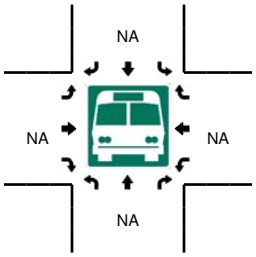












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Rental Car Dwy (Eastbound)				Rental Car Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:45 AM	0	59	0	0	0	21	0	1	3	21	12	0	0	0	0	0	117	
7:00 AM	0	36	1	0	0	13	0	0	6	15	12	0	0	0	0	0	83	
7:15 AM	0	25	1	0	2	14	0	0	2	10	12	0	0	0	0	0	66	
7:30 AM	0	32	2	0	1	28	0	0	1	7	8	0	0	0	0	0	79	345
7:45 AM	0	36	3	0	3	38	0	0	2	3	6	0	0	0	0	0	91	319
8:00 AM	0	35	2	0	3	29	0	0	6	4	4	0	0	0	0	0	83	319
8:15 AM	0	26	3	0	2	24	0	0	4	5	9	0	0	0	0	0	73	326
8:30 AM	0	40	1	0	0	31	0	0	4	5	14	0	0	0	0	0	95	342
8:45 AM	0	49	3	0	1	17	0	0	3	10	21	0	0	0	0	0	104	355
9:00 AM	0	47	3	0	1	21	0	0	7	14	18	0	0	0	0	0	111	383
9:15 AM	0	41	1	0	1	21	0	0	8	15	26	0	0	0	0	0	113	423
9:30 AM	0	48	2	0	3	15	0	0	8	21	17	0	0	0	0	0	114	442

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	192	8	0	12	60	0	0	32	84	68	0	0	0	0	0	456
Heavy Trucks	0	0	4		0	8	0		0	0	0		0	0	0		12
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

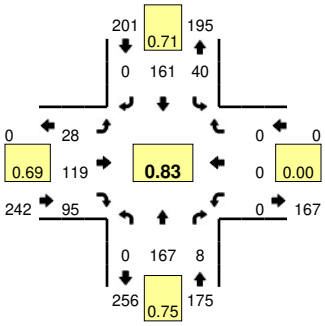
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

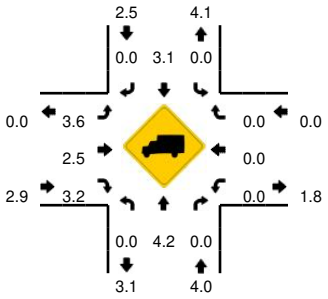
Method for determining peak hour: Total Entering Volume

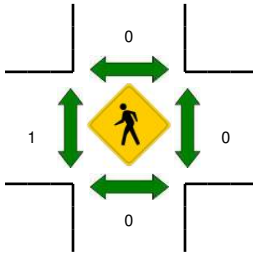
LOCATION: GSP Dr -- Rental Car Dwy
CITY/STATE: Greer, SC

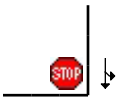
QC JOB #: 14557202
DATE: Tue, Nov 14 2017

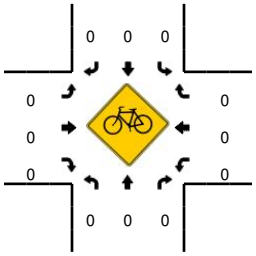


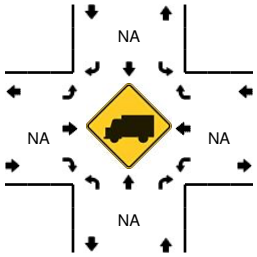
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

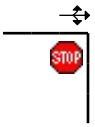


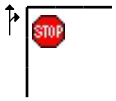


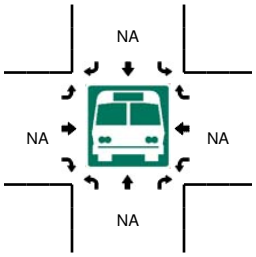












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Rental Car Dwy (Eastbound)				Rental Car Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:15 PM	0	39	3	0	6	20	0	0	7	14	23	0	0	0	0	0	112	
3:30 PM	0	54	7	0	9	28	0	0	7	64	27	0	0	0	0	0	196	
3:45 PM	0	34	4	0	15	31	0	1	5	46	28	0	0	0	0	0	164	
4:00 PM	0	29	3	0	1	30	0	0	3	24	21	0	0	0	0	0	111	583
4:15 PM	0	40	2	0	3	38	0	0	9	10	27	0	0	0	0	0	129	600
4:30 PM	0	50	9	0	13	46	0	0	7	34	31	0	0	0	0	0	190	594
4:45 PM	0	27	1	0	8	49	0	0	4	19	18	0	0	0	0	0	126	556
5:00 PM	0	40	3	0	6	37	0	0	5	20	20	0	0	0	0	0	131	576
5:15 PM	0	44	2	0	7	33	0	0	8	37	30	0	0	0	0	0	161	608
5:30 PM	0	40	2	0	23	53	0	0	8	37	23	0	0	0	0	0	186	604
5:45 PM	0	43	1	0	4	38	0	0	7	25	22	0	0	0	0	0	140	618
6:00 PM	0	25	2	0	5	45	0	0	1	22	18	0	0	0	0	0	118	605

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	160	8	0	92	212	0	0	32	148	92	0	0	0	0	0	744
Heavy Trucks	0	8	0		0	4	0		0	4	8		0	0	0		24
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 1

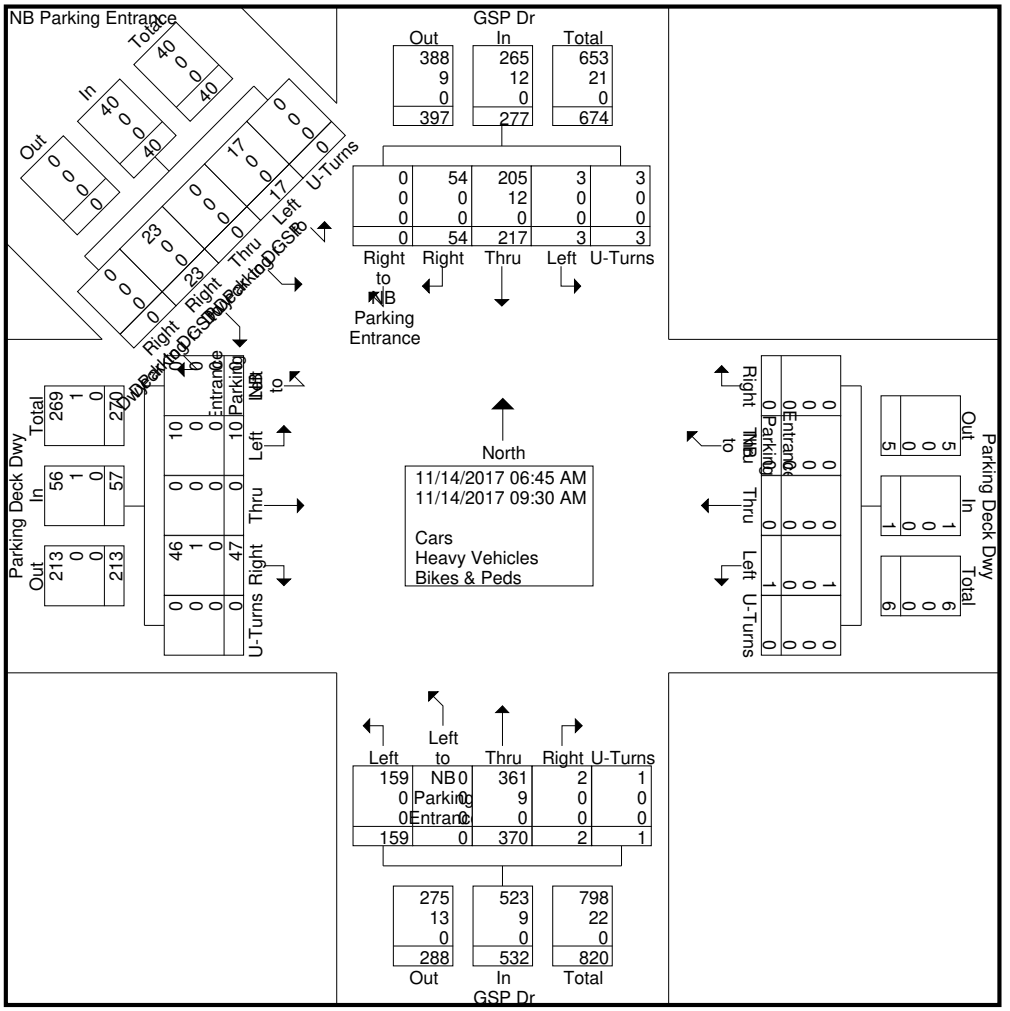
Groups Printed- Cars - Heavy Vehicles - Bikes & Peds

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
06:45 AM	0	5	15	0	0	20	0	0	0	0	0	0	1	57	0	5	0	63	6	0	0	0	0	6	0	1	0	1	0	2	91
Total	0	5	15	0	0	20	0	0	0	0	0	0	1	57	0	5	0	63	6	0	0	0	0	6	0	1	0	1	0	2	91
07:00 AM	0	3	7	2	0	12	0	0	0	0	0	0	0	33	0	9	0	42	3	0	0	0	0	3	0	3	0	1	0	4	61
07:15 AM	0	3	13	0	0	16	0	0	0	0	0	0	0	17	0	9	0	26	3	0	1	0	0	4	0	1	0	5	0	6	52
07:30 AM	0	1	21	1	1	24	0	0	0	0	0	0	0	19	0	14	0	33	5	0	1	0	0	6	0	1	0	1	0	2	65
07:45 AM	0	2	33	0	1	36	0	0	0	0	0	0	0	23	0	15	0	38	5	0	0	0	0	5	0	3	0	1	0	4	83
Total	0	9	74	3	2	88	0	0	0	0	0	0	0	92	0	47	0	139	16	0	2	0	0	18	0	8	0	8	0	16	261
08:00 AM	0	3	28	0	0	31	0	0	0	0	0	0	0	25	0	17	0	42	3	0	3	0	0	6	0	1	0	0	0	1	80
08:15 AM	0	3	22	0	0	25	0	0	0	0	0	0	0	16	0	14	0	30	2	0	0	0	0	2	0	4	0	1	0	5	62
08:30 AM	0	5	22	0	0	27	0	0	0	0	0	0	1	27	0	16	0	44	4	0	3	0	0	7	0	3	0	2	0	5	83
08:45 AM	0	9	14	0	0	23	0	0	0	1	0	1	0	34	0	19	1	54	3	0	1	0	0	4	0	0	0	3	0	3	85
Total	0	20	86	0	0	106	0	0	0	1	0	1	1	102																	
09:00 AM	0	3	16	0	1	20	0	0	0	0	0	0	0	37	0	17	0	54	4	0	0	0	0	4	0	3	0	2	0	5	83
09:15 AM	0	6	12	0	0	18	0	0	0	0	0	0	0	43	0	7	0	50	6	0	0	0	0	6	0	1	0	0	0	1	75
09:30 AM	0	11	14	0	0	25	0	0	0	0	0	0	0	39	0	17	0	56	3	0	1	0	0	4	0	2	0	0	0	2	87
Grand Total			217											370		159															
Apprch %		19.5	78.3							100				69.5		29.9			82.5		17.5					57.5		42.5			
			23.9											40.8		17.5															
Cars	0	54	205	3	3	265	0	0	0	1	0	1	2	361	0	159	1	523	46	0	10	0	0	56	0	23	0	17	0	40	885
% Cars	0	100	94.5	100	100	95.7	0	0	0	100	0	100	100	97.6	0	100	100	98.3	97.9	0	100	0	0	98.2	0	100	0	100	0	100	97.6
Heavy Vehicles	0	0	12	0	0	12	0	0	0	0	0	0	0	9	0	0	0	9	1	0	0	0	0	1	0	0	0	0	0	0	22
% Heavy Vehicles	0	0	5.5	0	0	4.3	0	0	0	0	0	0	0	2.4	0	0	0	1.7	2.1	0	0	0	0	1.8	0	0	0	0	0	0	2.4
Bikes & Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes & Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 2

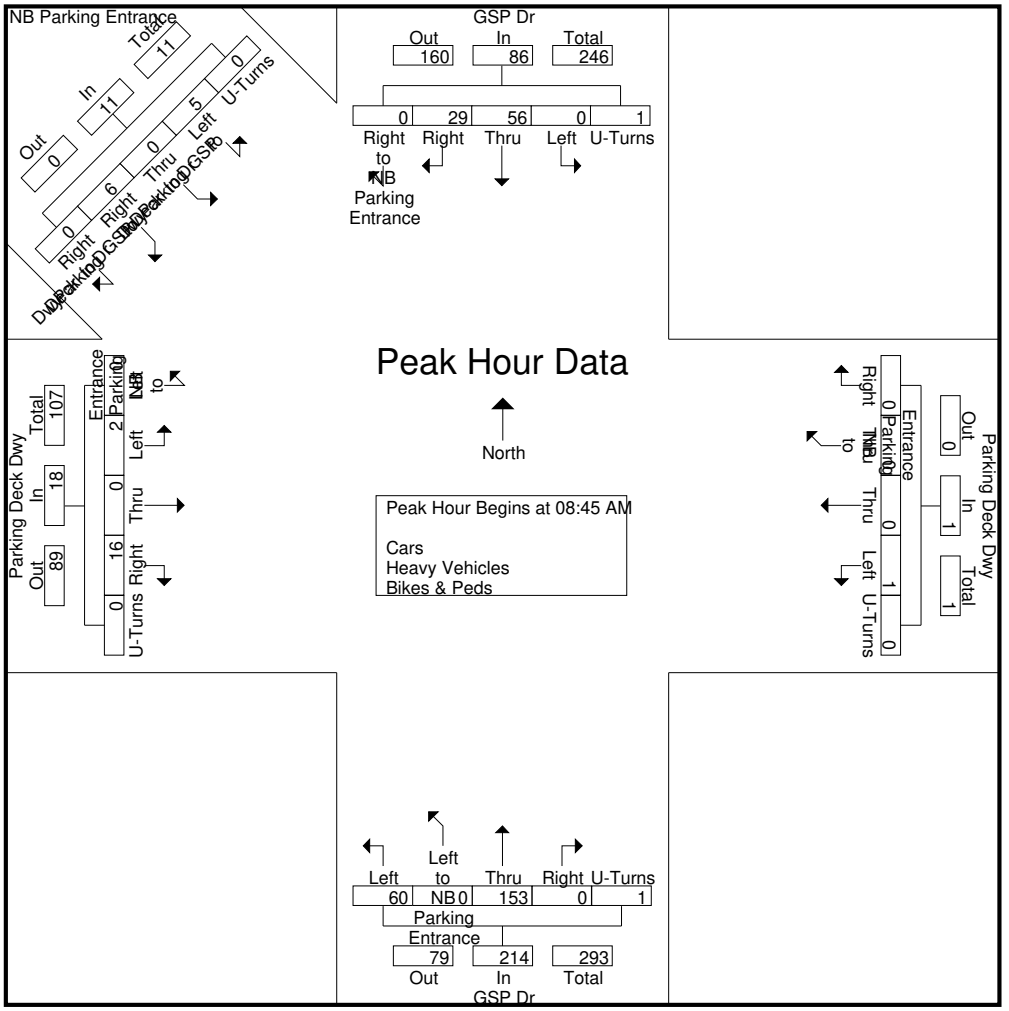


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 3

Start Time	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																														
Peak Hour for Entire Intersection Begins at 08:45 AM																														
08:45 AM	0	9	14	0	0	23	0	0	0	**1**	0	**1**	0	34	0	**19**	**1**	54	3	0	**1**	0	0	4	0	0	0	**3**	0	3	85
09:00 AM	0	3	**16**	0	**1**	20	0	0	0	0	0	0	0	37	0	17	0	54	4	0	0	0	0	4	0	**3**	0	2	0	**5**	83
09:15 AM	0	6	12	0	0	18	0	0	0	0	0	0	0	**43**	0	7	0	50	**6**	0	0	0	0	**6**	0	1	0	0	0	1	75
09:30 AM	0	**11**	14	0	0	**25**	0	0	0	0	0	0	0	39	0	17	0	**56**	3	0	1	0	0	4	0	2	0	0	0	2	**87**
Total Volume	0	29	56	0	1	86	0	0	0	1	0	1	0	153	0	60	1	214	16	0	2	0	0	18	0	6	0	5	0	11	330
% App. Total	0	33.7	65.1	0	1.2		0	0	0	100	0		0	71.5	0	28	0.5		88.9	0	11.1	0	0		0	54.5	0	45.5	0		
PHF	.000	.659	.875	.000	.250	.860	.000	.000	.000	.250	.000	.250	.000	.890	.000	.789	.250	.955	.667	.000	.500	.000	.000	.750	.000	.500	.000	.417	.000	.550	.948

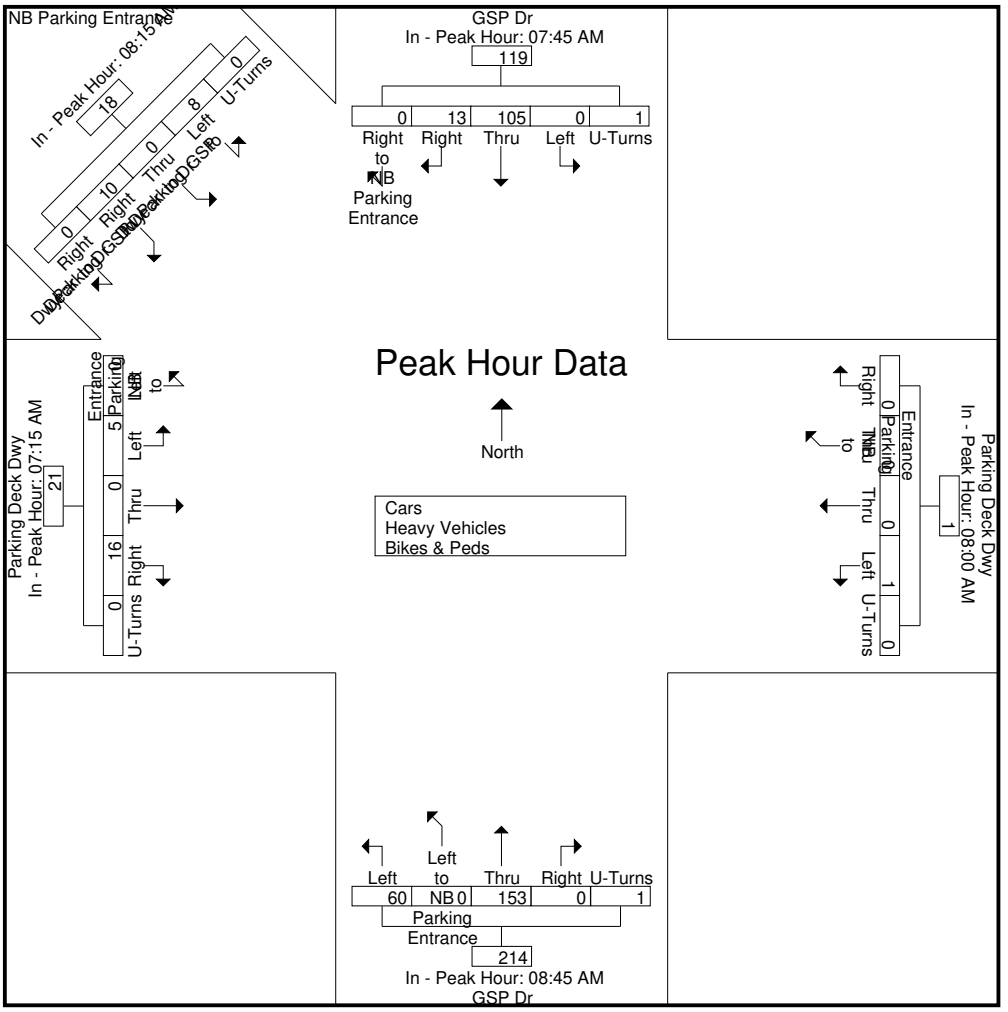


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 4

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	07:45 AM						08:00 AM						08:45 AM						07:15 AM						08:15 AM						
+0 mins.	0	2	**33**	0	**1**	**36**	0	0	0	0	0	0	0	34	0	**19**	**1**	54	3	0	1	0	0	4	0	**4**	0	1	0	**5**	
+15 mins.	0	3	28	0	0	31	0	0	0	0	0	0	0	37	0	17	0	54	**5**	0	1	0	0	**6**	0	3	0	2	0	5	
+30 mins.	0	3	22	0	0	25	0	0	0	0	0	0	0	**43**	0	7	0	50	5	0	0	0	0	5	0	0	0	**3**	0	3	
+45 mins.	0	**5**	22	0	0	27	0	0	0	**1**	0	**1**	0	39	0	17	0	**56**	3	0	**3**	0	0	6	0	3	0	2	0	5	
Total Volume	0	13	105	0	1	119	0	0	0	1	0	1	0	153	0	60	1	214	16	0	5	0	0	21	0	10	0	8	0	18	
% App. Total	0	10.9	88.2	0	0.8		0	0	0	100	0		0	71.5	0	28	0.5		76.2	0	23.8	0	0		0	55.6	0	44.4	0		
PHF	.000	.650	.795	.000	.250	.826	.000	.000	.000	.250	.000	.250	.000	.890	.000	.789	.250	.955	.800	.000	.417	.000	.000	.875	.000	.625	.000	.667	.000	.900	



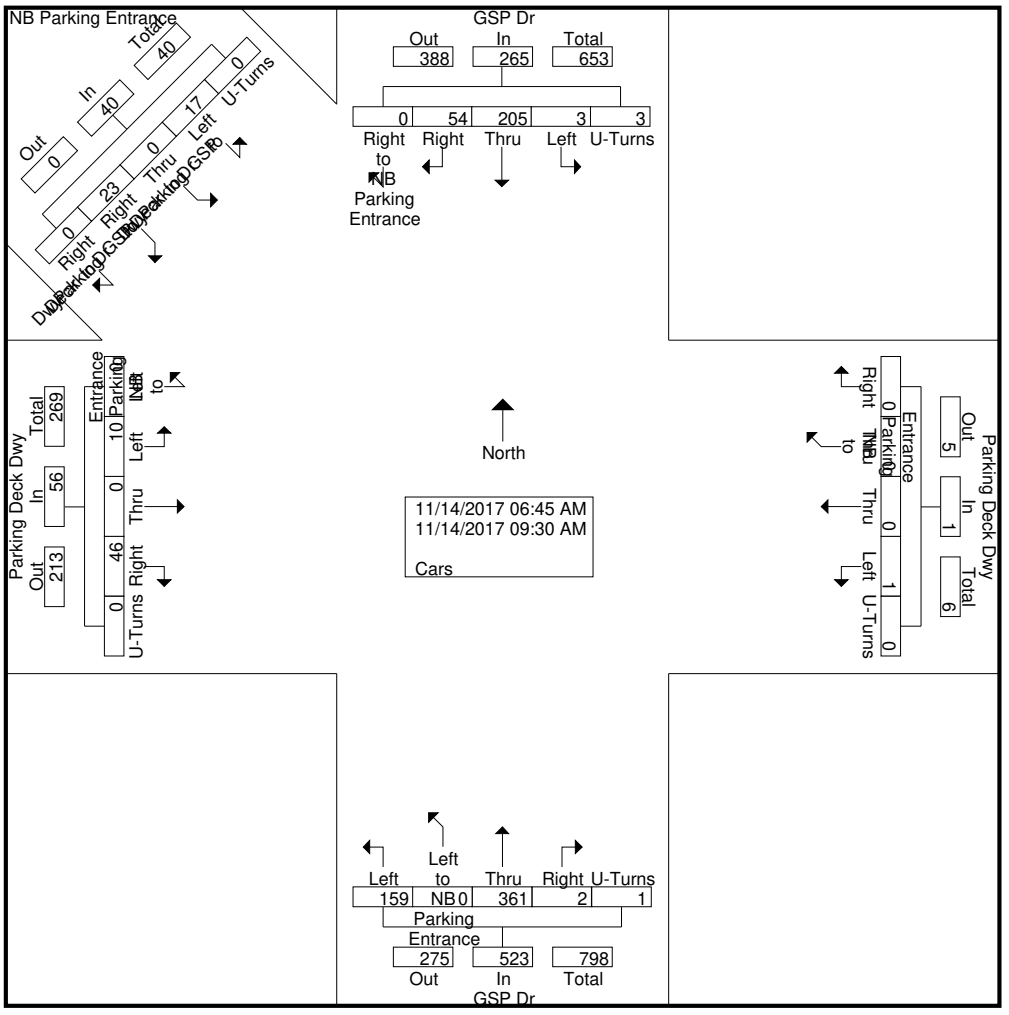
Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 1

Groups Printed- Cars

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
06:45 AM	0	5	15	0	0	20	0	0	0	0	0	0	1	57	0	5	0	63	6	0	0	0	0	6	0	1	0	1	0	2	91
Total	0	5	15	0	0	20	0	0	0	0	0	0	1	57	0	5	0	63	6	0	0	0	0	6	0	1	0	1	0	2	91
07:00 AM	0	3	7	2	0	12	0	0	0	0	0	0	0	33	0	9	0	42	3	0	0	0	0	3	0	3	0	1	0	4	61
07:15 AM	0	3	13	0	0	16	0	0	0	0	0	0	0	17	0	9	0	26	3	0	1	0	0	4	0	1	0	5	0	6	52
07:30 AM	0	1	20	1	1	23	0	0	0	0	0	0	0	17	0	14	0	31	5	0	1	0	0	6	0	1	0	1	0	2	62
07:45 AM	0	2	33	0	1	36	0	0	0	0	0	0	0	20	0	15	0	35	5	0	0	0	0	5	0	3	0	1	0	4	80
Total	0	9	73	3	2	87	0	0	0	0	0	0	0	87	0	47	0	134	16	0	2	0	0	18	0	8	0	8	0	16	255
08:00 AM	0	3	26	0	0	29	0	0	0	0	0	0	0	24	0	17	0	41	3	0	3	0	0	6	0	1	0	0	0	1	77
08:15 AM	0	3	20	0	0	23	0	0	0	0	0	0	0	15	0	14	0	29	1	0	0	0	0	1	0	4	0	1	0	5	58
08:30 AM	0	5	19	0	0	24	0	0	0	0	0	0	1	26	0	16	0	43	4	0	3	0	0	7	0	3	0	2	0	5	79
08:45 AM	0	9	13	0	0	22	0	0	0	1	0	1	0	34	0	19	1	54	3	0	1	0	0	4	0	0	0	3	0	3	84
Total	0	20	78	0	0	98	0	0	0	1	0	1	1	99	0	66	1	167	11	0	7	0	0	18	0	8	0	6	0	14	298
09:00 AM	0	3	16	0	1	20	0	0	0	0	0	0	0	36	0	17	0	53	4	0	0	0	0	4	0	3	0	2	0	5	82
09:15 AM	0	6	11	0	0	17	0	0	0	0	0	0	0	43	0	7	0	50	6	0	0	0	0	6	0	1	0	0	0	1	74
09:30 AM	0	11	12	0	0	23	0	0	0	0	0	0	0	39	0	17	0	56	3	0	1	0	0	4	0	2	0	0	0	2	85
Grand Total			205											361		159														
Apprch %		20.4	77.4							100						30.4			82.1		17.9					57.5		42.5		
			23.2											40.8																

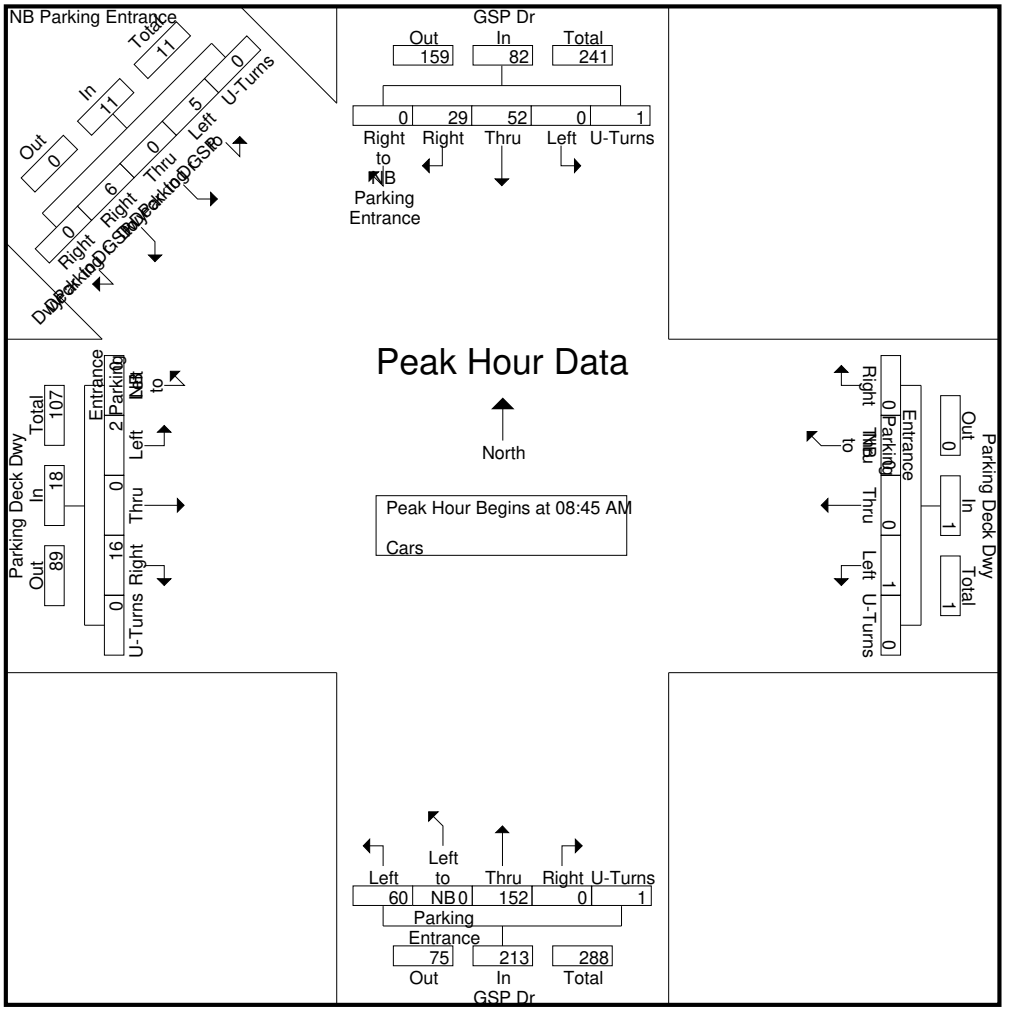


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 2

Start Time	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 08:45 AM																															
08:45 AM	0	9	13	0	0	22	0	0	0	**1**	0	**1**	0	34	0	**19**	**1**	54	3	0	**1**	0	0	4	0	0	0	**3**	0	3	84
09:00 AM	0	3	**16**	0	**1**	20	0	0	0	0	0	0	0	36	0	17	0	53	4	0	0	0	0	4	0	**3**	0	2	0	**5**	82
09:15 AM	0	6	11	0	0	17	0	0	0	0	0	0	0	**43**	0	7	0	50	**6**	0	0	0	0	**6**	0	1	0	0	0	1	74
09:30 AM	0	**11**	12	0	0	**23**	0	0	0	0	0	0	0	39	0	17	0	**56**	3	0	1	0	0	4	0	2	0	0	0	2	**85**
Total Volume	0	29	52	0	1	82	0	0	0	1	0	1	0	152	0	60	1	213	16	0	2	0	0	18	0	6	0	5	0	11	325
% App. Total	0	35.4	63.4	0	1.2		0	0	0	100	0		0	71.4	0	28.2	0.5		88.9	0	11.1	0	0		0	54.5	0	45.5	0		
PHF	.000	.659	.813	.000	.250	.891	.000	.000	.000	.250	.000	.250	.000	.884	.000	.789	.250	.951	.667	.000	.500	.000	.000	.750	.000	.500	.000	.417	.000	.550	.956

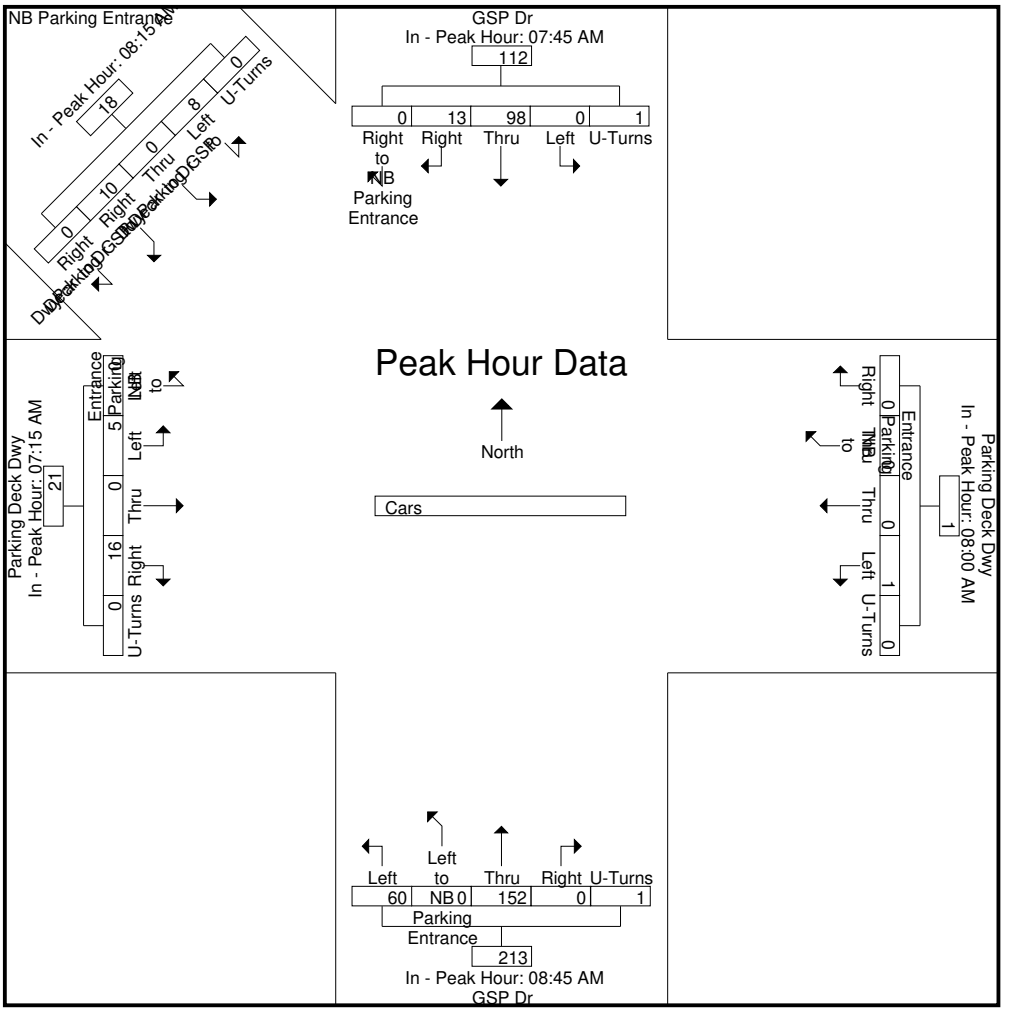


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 3

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	07:45 AM						08:00 AM						08:45 AM						07:15 AM						08:15 AM						
+0 mins.	0	2	**33**	0	**1**	**36**	0	0	0	0	0	0	0	34	0	**19**	**1**	54	3	0	1	0	0	4	0	**4**	0	1	0	**5**	
+15 mins.	0	3	26	0	0	29	0	0	0	0	0	0	0	36	0	17	0	53	**5**	0	1	0	0	**6**	0	3	0	2	0	5	
+30 mins.	0	3	20	0	0	23	0	0	0	0	0	0	0	**43**	0	7	0	50	5	0	0	0	0	5	0	0	0	**3**	0	3	
+45 mins.	0	**5**	19	0	0	24	0	0	0	**1**	0	**1**	0	39	0	17	0	**56**	3	0	**3**	0	0	6	0	3	0	2	0	5	
Total Volume	0	13	98	0	1	112	0	0	0	1	0	1	0	152	0	60	1	213	16	0	5	0	0	21	0	10	0	8	0	18	
% App. Total	0	11.6	87.5	0	0.9		0	0	0	100	0		0	71.4	0	28.2	0.5		76.2	0	23.8	0	0		0	55.6	0	44.4	0		
PHF	.000	.650	.742	.000	.250	.778	.000	.000	.000	.250	.000	.250	.000	.884	.000	.789	.250	.951	.800	.000	.417	.000	.000	.875	.000	.625	.000	.667	.000	.900	



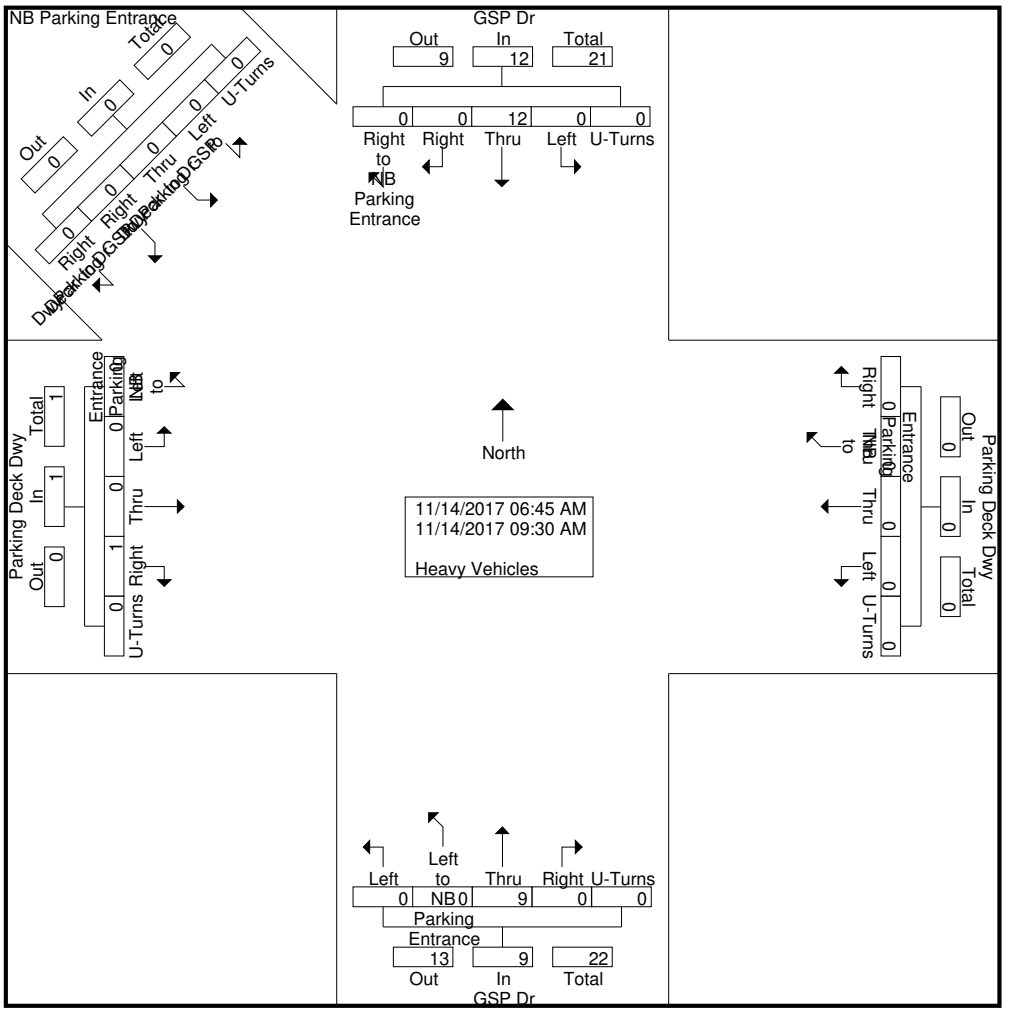
Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 1

Groups Printed- Heavy Vehicles

Start Time	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	0	1	0	0	1	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	6
08:00 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
08:15 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	4
08:30 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
08:45 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	8	0	0	8	0	0	0	0	0	0	0	3	0	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	12
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
09:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
09:30 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Grand Total																															
Apprch %			100											100					100												
			54.5											40.9																	

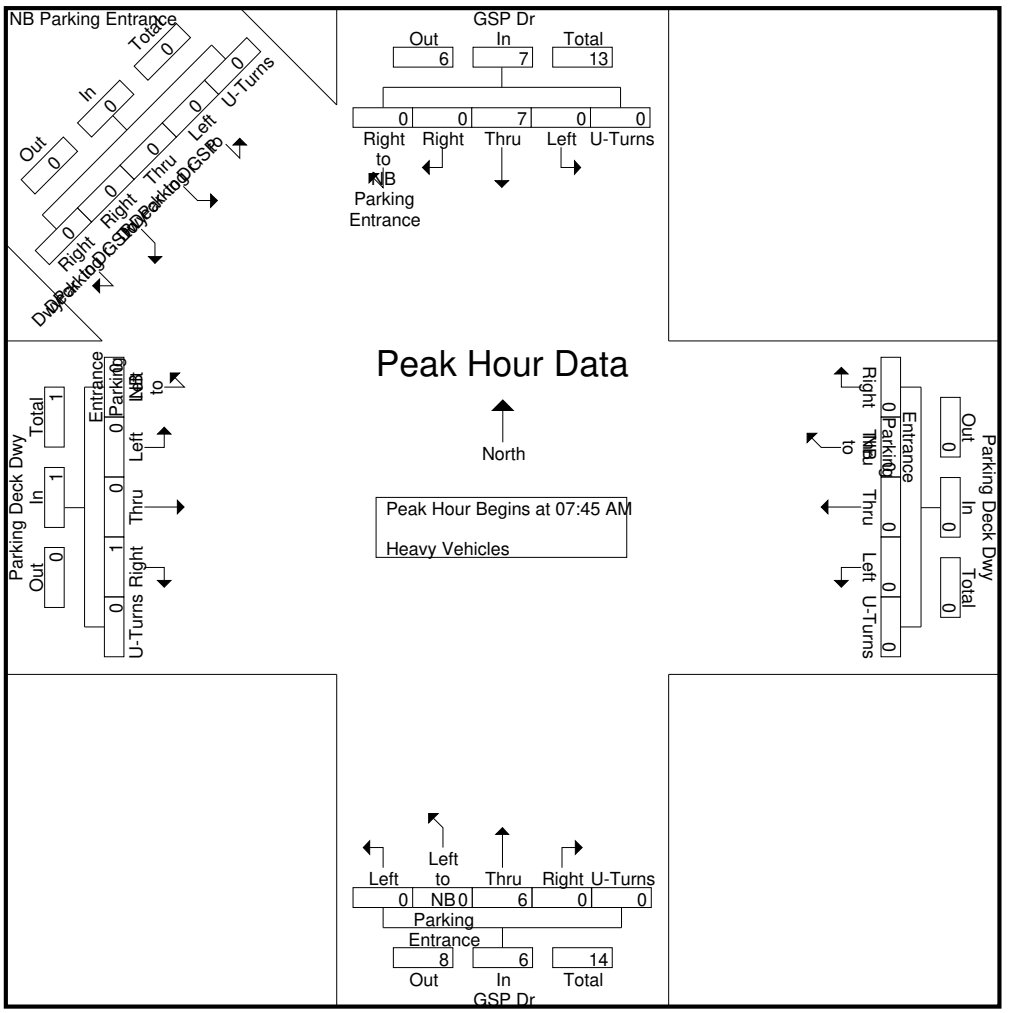


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 2

Start Time	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 07:45 AM																															
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	3
08:00 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
08:15 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	**1**					**1**							**4**
08:30 AM	0	0	**3**	0	0	**3**	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
Total Volume	0	0	7	0	0	7	0	0	0	0	0	0	0	6	0	0	0	6	1	0	0	0	0	1	0	0	0	0	0	0	14
% App. Total	0	0	100	0	0		0	0	0	0	0		0	100	0	0	0		100	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.583	.000	.000	.583	.000	.000	.000	.000	.000	.000	.000	.500	.000	.000	.000	.500	.250	.000	.000	.000	.000	.250	.000	.000	.000	.000	.000	.000	.875

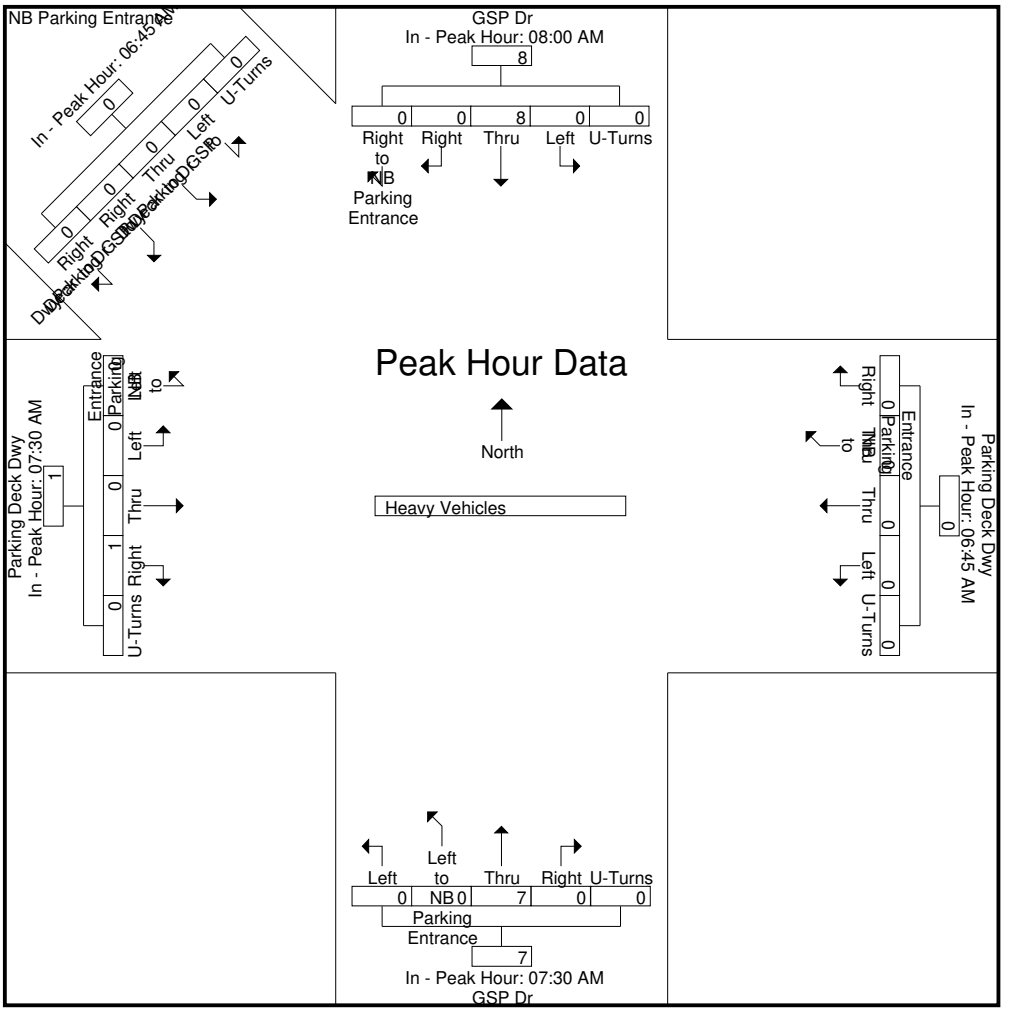


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 3

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																														
Peak Hour for Each Approach Begins at:																														
	08:00 AM						06:45 AM						07:30 AM						07:30 AM						06:45 AM						
+0 mins.	0	0	2	0	0	2	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
+15 mins.	0	0	2	0	0	2	0	0	0	0	0	0	0	**3**	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	
+30 mins.	0	0	**3**	0	0	**3**	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
+45 mins.	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	**1**	0	0	0	0	**1**	0	0	0	0	0	0	
Total Volume	0	0	8	0	0	8	0	0	0	0	0	0	0	7	0	0	0	7	1	0	0	0	0	1	0	0	0	0	0	0	
% App. Total	0	0	100	0	0		0	0	0	0	0		0	100	0	0	0		100	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.667	.000	.000	.667	.000	.000	.000	.000	.000	.000	.000	.583	.000	.000	.000	.583	.250	.000	.000	.000	.000	.250	.000	.000	.000	.000	.000	.000	



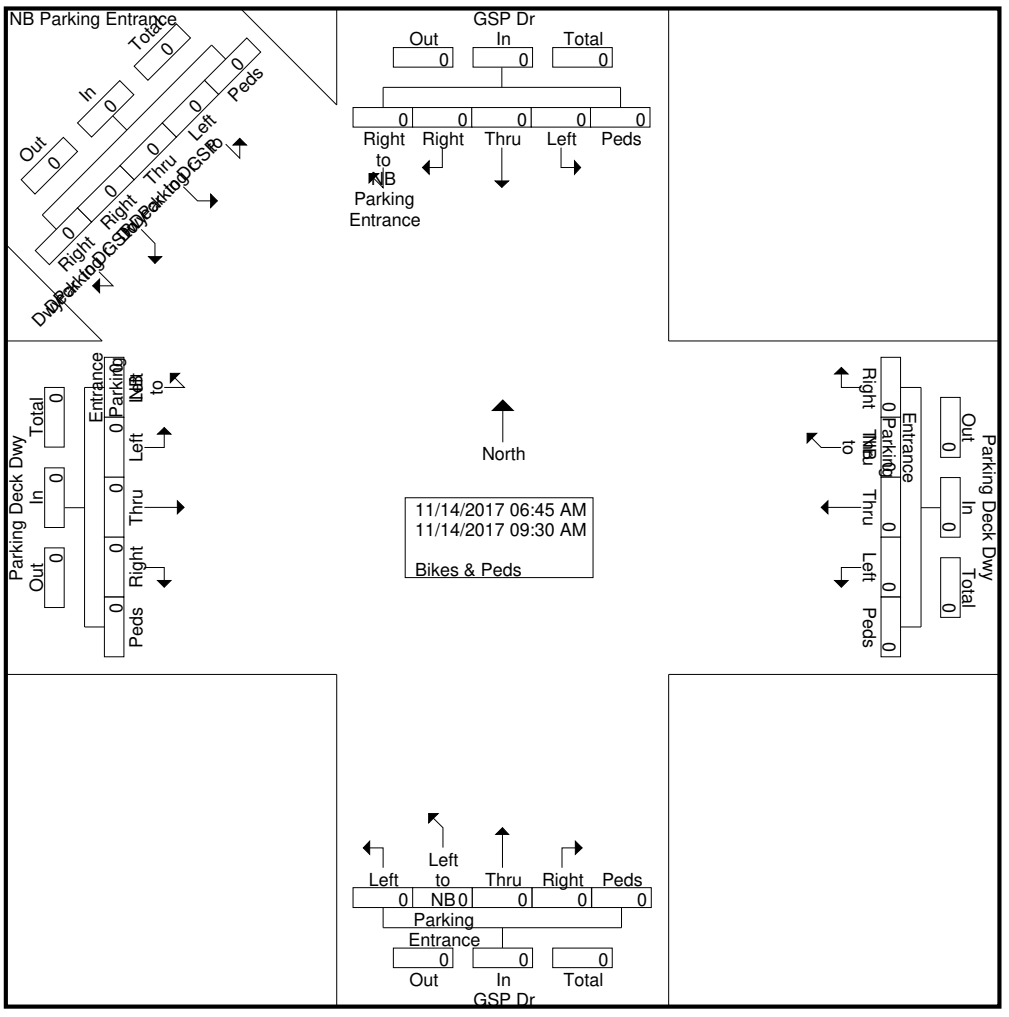
Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 1

Groups Printed- Bikes & Peds

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total																															
Apprch %																															

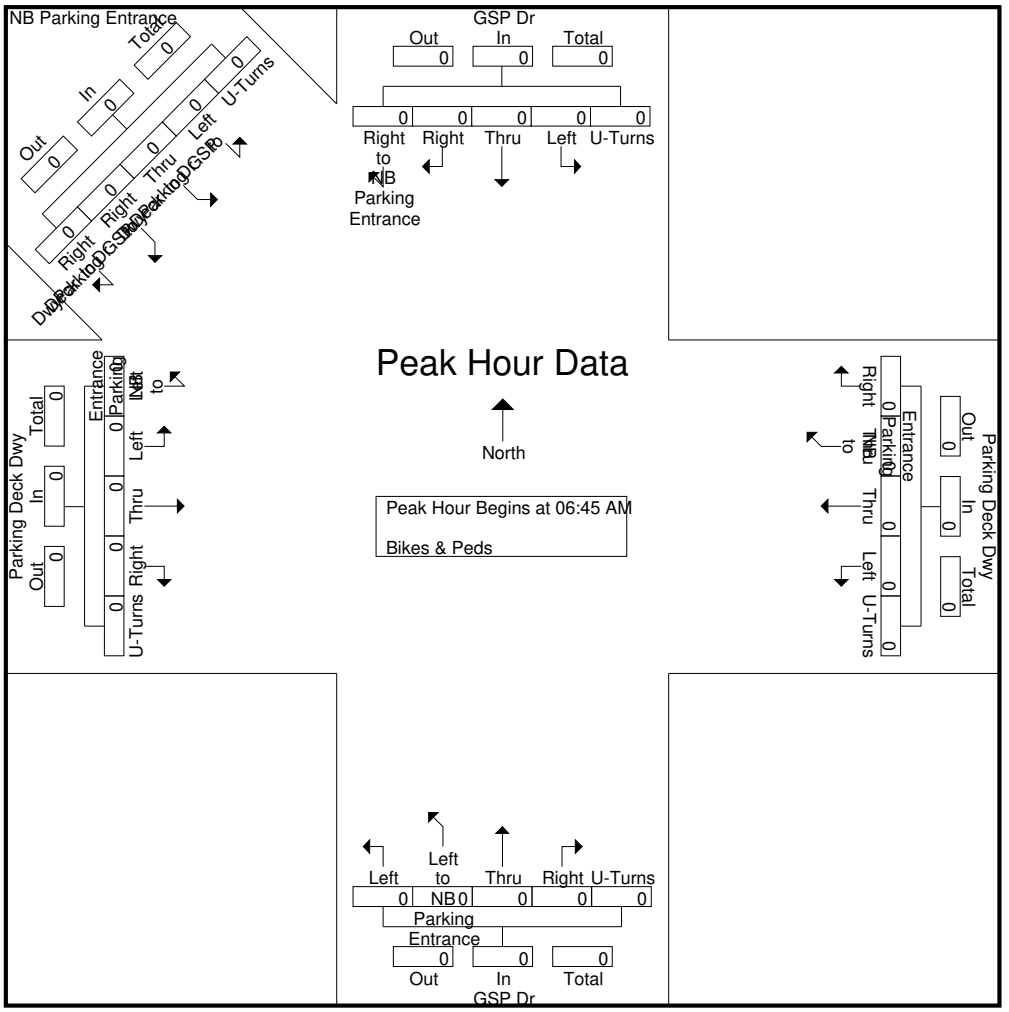


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 2

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 06:45 AM																															
06:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume																															
% App. Total	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

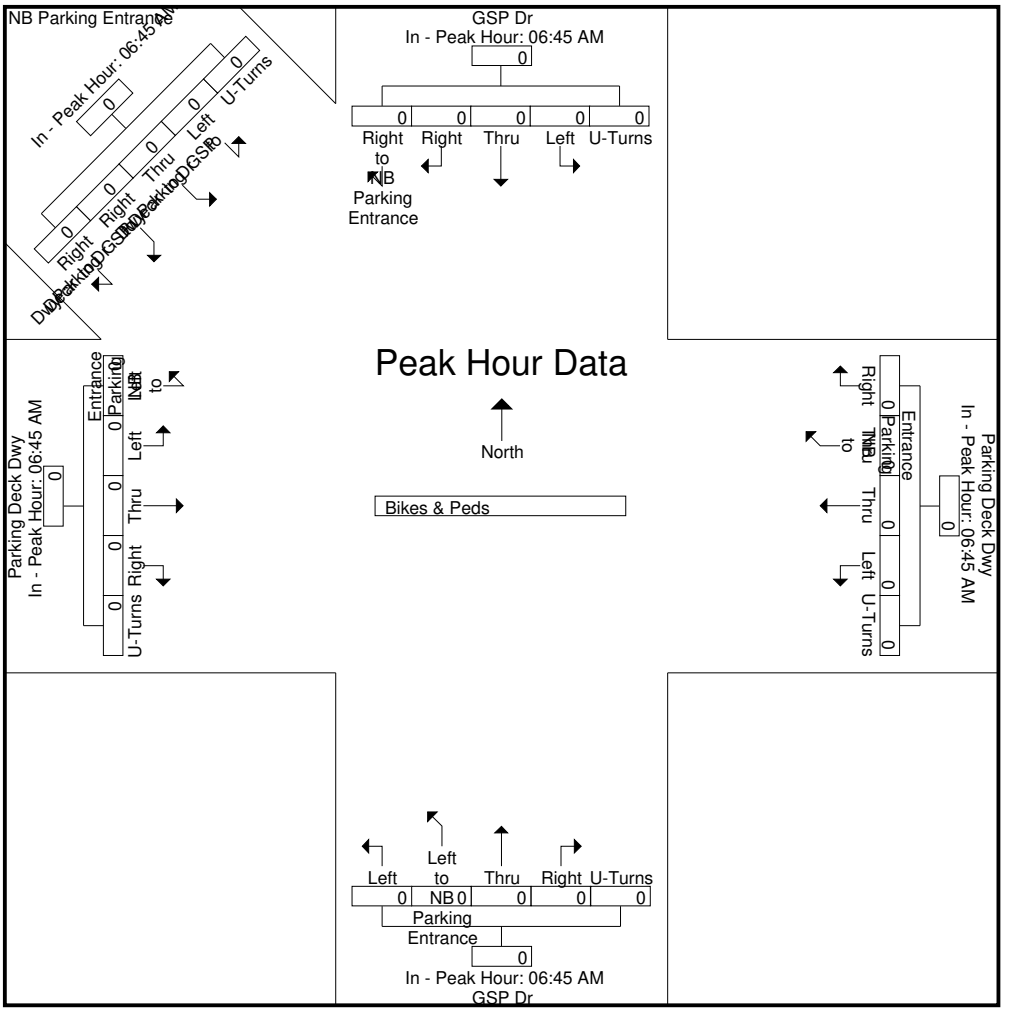


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557203
Site Code : 14557203
Start Date : 11/14/2017
Page No : 3

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 09:30 AM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	06:45 AM						06:45 AM						06:45 AM						06:45 AM						06:45 AM						
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
% App. Total	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	



Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 1

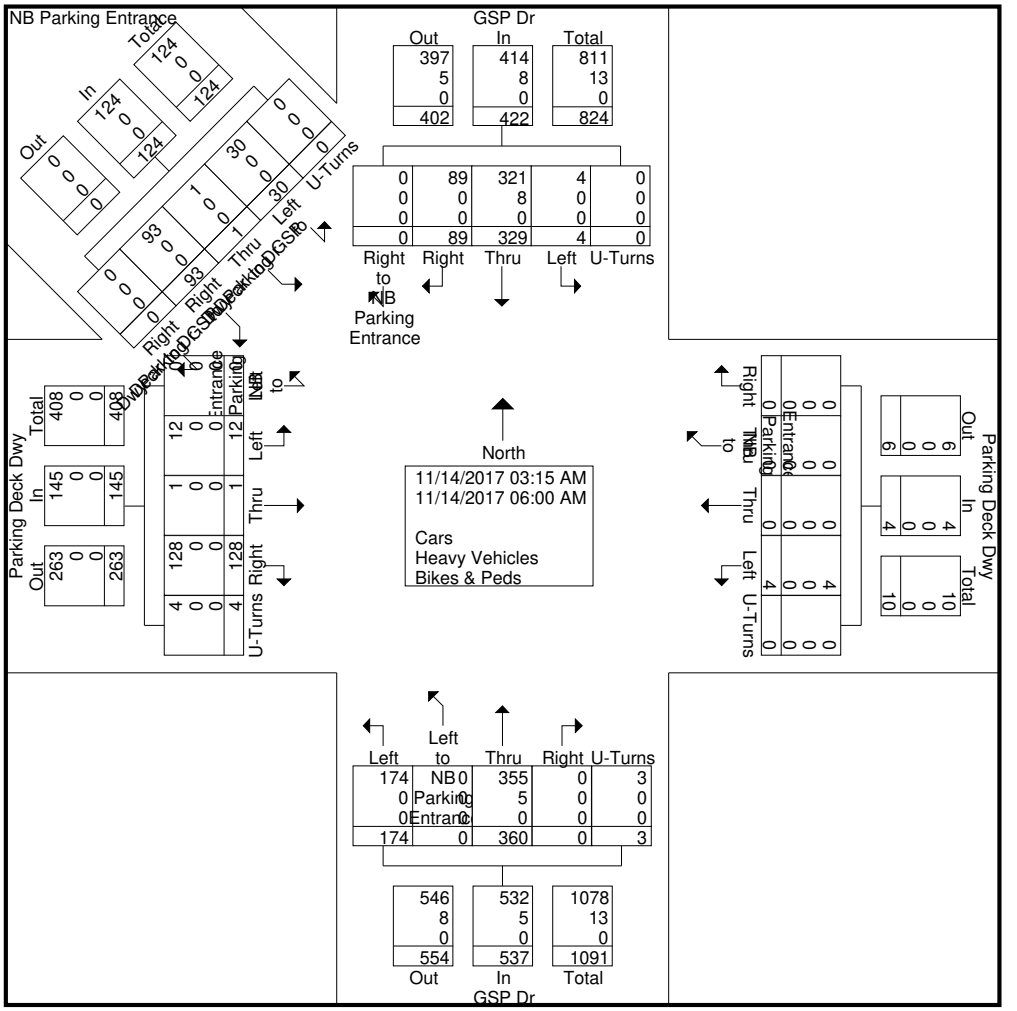
Groups Printed- Cars - Heavy Vehicles - Bikes & Peds

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
03:15 AM	0	8	16	0	0	24	0	0	0	0	0	0	0	36	0	10	1	47	6	0	0	0	0	6	0	5	0	1	0	6	83
03:30 AM	0	11	19	3	0	33	0	0	0	1	0	1	0	45	0	13	2	60	14	0	1	0	0	15	0	9	0	3	0	12	121
03:45 AM	0	6	19	0	0	25	0	0	0	0	0	0	0	25	0	15	0	40	13	0	3	0	0	16	0	12	0	4	0	16	97
Total	0	25	54	3	0	82	0	0	0	1	0	1	0	106																	
04:00 AM	0	12	20	0	0	32	0	0	0	0	0	0	0	21	0	11	0	32	6	0	1	0	0	7	0	4	0	0	0	4	75
04:15 AM	0	7	30	0	0	37	0	0	0	0	0	0	0	30	0	18	0	48	6	0	0	0	0	6	0	6	1	3	0	10	101
04:30 AM	0	4	36	0	0	40	0	0	0	1	0	1	0	44	0	13	0	57	11	0	1	0	0	12	0	13	0	3	0	16	126
04:45 AM	0	6	42	1	0	49	0	0	0	2	0	2	0	23	0	8	0	31	9	0	1	0	0	10	0	3	0	2	0	5	97
Total	0	29	128											118																	
05:00 AM	0	7	29	0	0	36	0	0	0	0	0	0	0	32	0	13	0	45	11	0	1	0	0	12	0	4	0	5	0	9	102
05:15 AM	0	8	24	0	0	32	0	0	0	0	0	0	0	38	0	14	0	52	9	0	1	0	0	10	0	8	0	2	0	10	104
05:30 AM	0	8	40	0	0	48	0	0	0	0	0	0	0	31	0	18	0	49	19	1	2	0	1	23	0	14	0	4	0	18	138
05:45 AM	0	7	28	0	0	35	0	0	0	0	0	0	0	26	0	24	0	50	7	0	0	0	2	9	0	8	0	2	0	10	104
Total	0	30	121											127																	
06:00 AM	0	5	26	0	0	31	0	0	0	0	0	0	0	9	0	17	0	26	17	0	1	0	1	19	0	7	0	1	0	8	84
Grand Total			329											360		174			128												1232
Apprch %		21.1								100						32.4			88.3								24.2				
			26.7											29.2		14.1			10.4												
Cars	0	89	321	4	0	414	0	0	0	4	0	4	0	355	0	174	3	532	128	1	12	0	4	145	0	93	1	30	0	124	1219
% Cars	0	100	97.6	100	0	98.1	0	0	0	100	0	100	0	98.6	0	100	100	99.1	100	100	100	0	100	100	0	100	100	100	0	100	98.9
Heavy Vehicles	0	0	8	0	0	8	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	13
% Heavy Vehicles	0	0	2.4	0	0	1.9	0	0	0	0	0	0	0	1.4	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	1.1
Bikes & Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes & Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 2

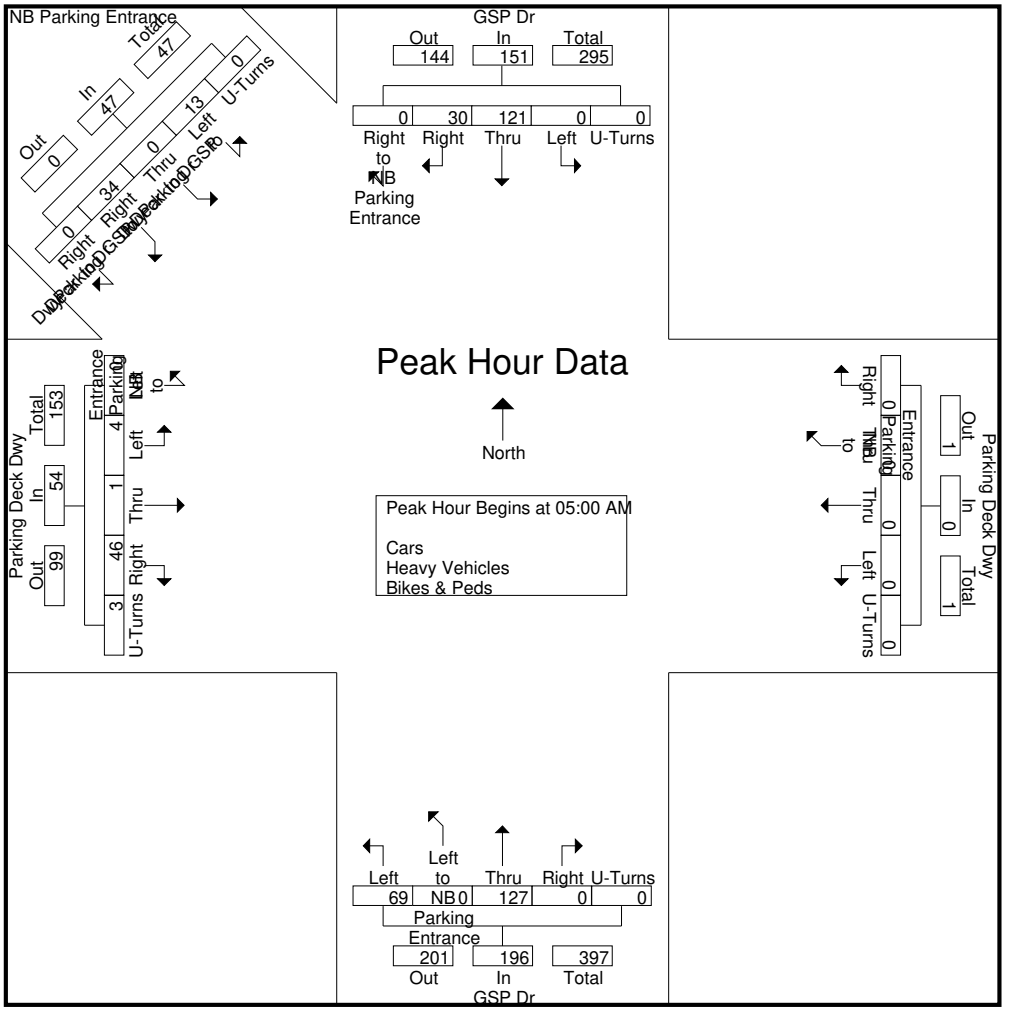


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 3

Start Time	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 05:00 AM																															
05:00 AM	0	7	29	0	0	36	0	0	0	0	0	0	0	32	0	13	0	45	11	0	1	0	0	12	0	4	0	**5**	0	9	102
05:15 AM	0	**8**	24	0	0	32	0	0	0	0	0	0	0	**38**	0	14	0	**52**	9	0	1	0	0	10	0	8	0	2	0	10	104
05:30 AM	0	8	**40**	0	0	**48**	0	0	0	0	0	0	0	31	0	18	0	49	**19**	**1**	**2**	0	1	**23**	0	**14**	0	4	0	**18**	**138**
05:45 AM	0	7	28	0	0	35	0	0	0	0	0	0	0	26	0	**24**	0	50	7	0	0	0	**2**	9	0	8	0	2	0	10	104
Total Volume	0	30	121	0	0	151	0	0	0	0	0	0	0	127	0	69	0	196	46	1	4	0	3	54	0	34	0	13	0	47	448
% App. Total	0	19.9	80.1	0	0		0	0	0	0	0		0	64.8	0	35.2	0		85.2	1.9	7.4	0	5.6		0	72.3	0	27.7	0		
PHF	.000	.938	.756	.000	.000	.786	.000	.000	.000	.000	.000	.000	.000	.836	.000	.719	.000	.942	.605	.250	.500	.000	.375	.587	.000	.607	.000	.650	.000	.653	.812

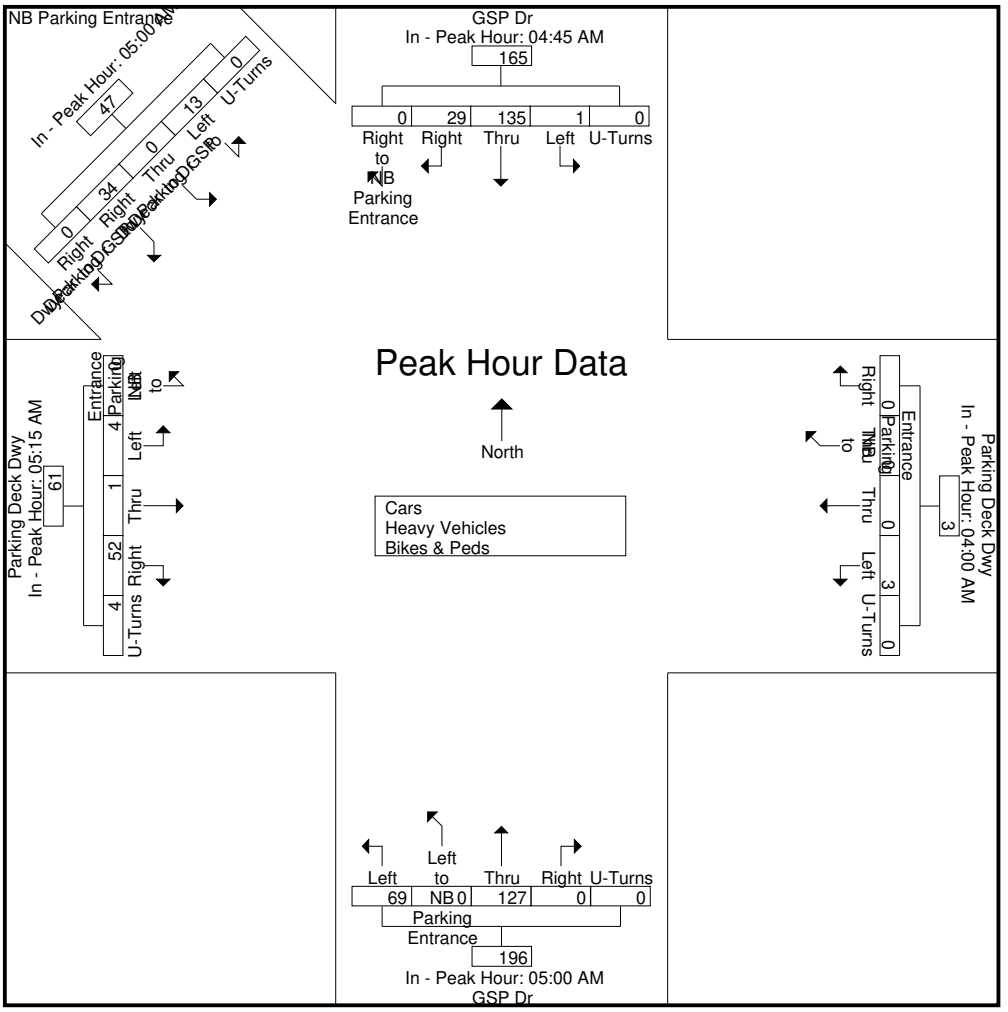


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 4

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																														
Peak Hour for Each Approach Begins at:																														
	04:45 AM						04:00 AM						05:00 AM						05:15 AM						05:00 AM						
+0 mins.	0	6	**42**	**1**	0	**49**	0	0	0	0	0	0	0	32	0	13	0	45	9	0	1	0	0	10	0	4	0	**5**	0	9	
+15 mins.	0	7	29	0	0	36	0	0	0	0	0	0	0	**38**	0	14	0	**52**	**19**	**1**	**2**	0	1	**23**	0	8	0	2	0	10	
+30 mins.	0	**8**	24	0	0	32	0	0	0	1	0	1	0	31	0	18	0	49	7	0	0	0	**2**	9	0	**14**	0	4	0	**18**	
+45 mins.	0	8	40	0	0	48	0	0	0	**2**	0	**2**	0	26	0	**24**	0	50	17	0	1	0	1	19	0	8	0	2	0	10	
Total Volume	0	29	135	1	0	165	0	0	0	3	0	3	0	127	0	69	0	196	52	1	4	0	4	61	0	34	0	13	0	47	
% App. Total	0	17.6	81.8	0.6	0		0	0	0	100	0		0	64.8	0	35.2	0		85.2	1.6	6.6	0	6.6		0	72.3	0	27.7	0		
PHF	.000	.906	.804	.250	.000	.842	.000	.000	.000	.375	.000	.375	.000	.836	.000	.719	.000	.942	.684	.250	.500	.000	.500	.663	.000	.607	.000	.650	.000	.653	



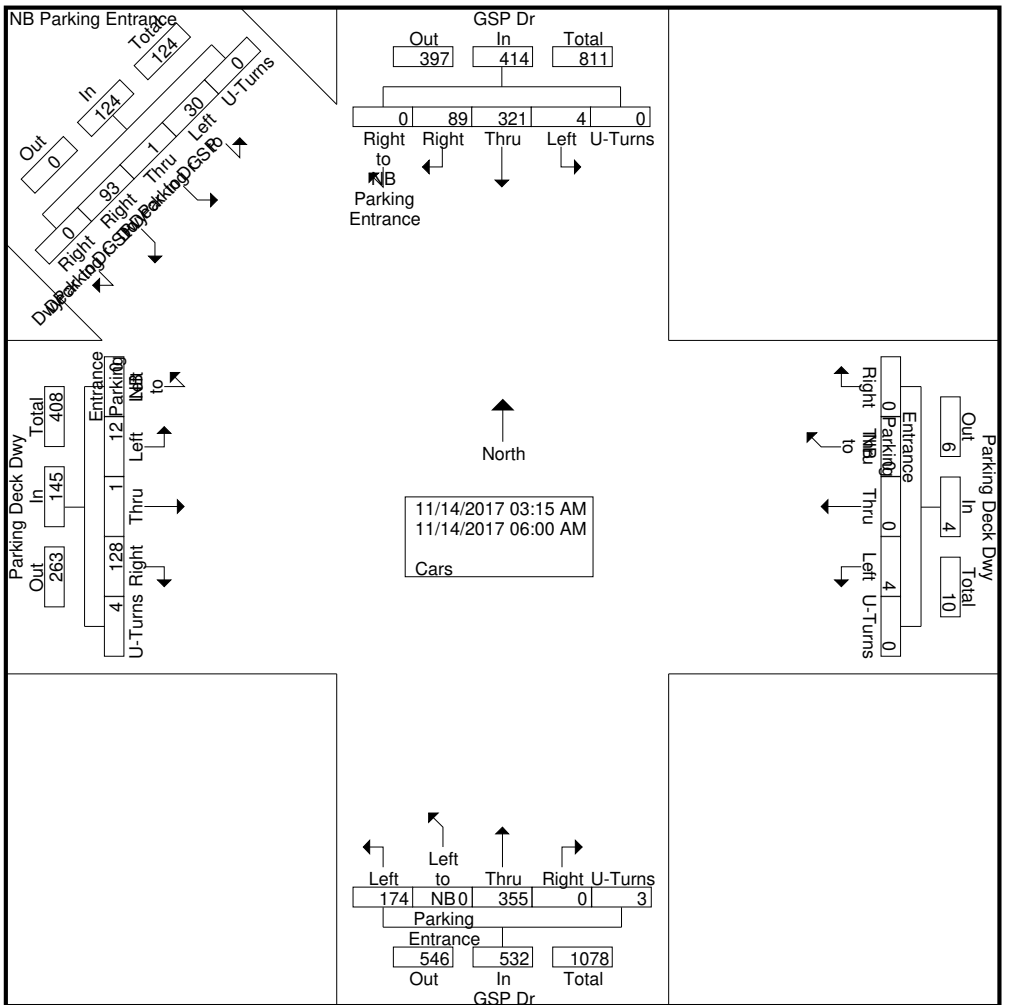
Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 1

Groups Printed- Cars

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
03:15 AM	0	8	15	0	0	23	0	0	0	0	0	0	0	36	0	10	1	47	6	0	0	0	0	6	0	5	0	1	0	6	82
03:30 AM	0	11	19	3	0	33	0	0	0	1	0	1	0	44	0	13	2	59	14	0	1	0	0	15	0	9	0	3	0	12	120
03:45 AM	0	6	19	0	0	25	0	0	0	0	0	0	0	25	0	15	0	40	13	0	3	0	0	16	0	12	0	4	0	16	97
Total	0	25	53	3	0	81	0	0	0	1	0	1	0	105																	
04:00 AM	0	12	20	0	0	32	0	0	0	0	0	0	0	21	0	11	0	32	6	0	1	0	0	7	0	4	0	0	0	4	75
04:15 AM	0	7	28	0	0	35	0	0	0	0	0	0	0	30	0	18	0	48	6	0	0	0	0	6	0	6	1	3	0	10	99
04:30 AM	0	4	36	0	0	40	0	0	0	1	0	1	0	44	0	13	0	57	11	0	1	0	0	12	0	13	0	3	0	16	126
04:45 AM	0	6	39	1	0	46	0	0	0	2	0	2	0	23	0	8	0	31	9	0	1	0	0	10	0	3	0	2	0	5	94
Total	0	29	123											118																	
05:00 AM	0	7	29	0	0	36	0	0	0	0	0	0	0	32	0	13	0	45	11	0	1	0	0	12	0	4	0	5	0	9	102
05:15 AM	0	8	23	0	0	31	0	0	0	0	0	0	0	34	0	14	0	48	9	0	1	0	0	10	0	8	0	2	0	10	99
05:30 AM	0	8	39	0	0	47	0	0	0	0	0	0	0	31	0	18	0	49	19	1	2	0	1	23	0	14	0	4	0	18	137
05:45 AM	0	7	28	0	0	35	0	0	0	0	0	0	0	26	0	24	0	50	7	0	0	0	2	9	0	8	0	2	0	10	104
Total	0	30	119											123																	
06:00 AM	0	5	26	0	0	31	0	0	0	0	0	0	0	9	0	17	0	26	17	0	1	0	1	19	0	7	0	1	0	8	84
Grand Total			321											355		174			128												1219
Apprch %		21.5	77.5							100				66.7		32.7			88.3									24.2			
			26.3											29.1		14.3			10.5												

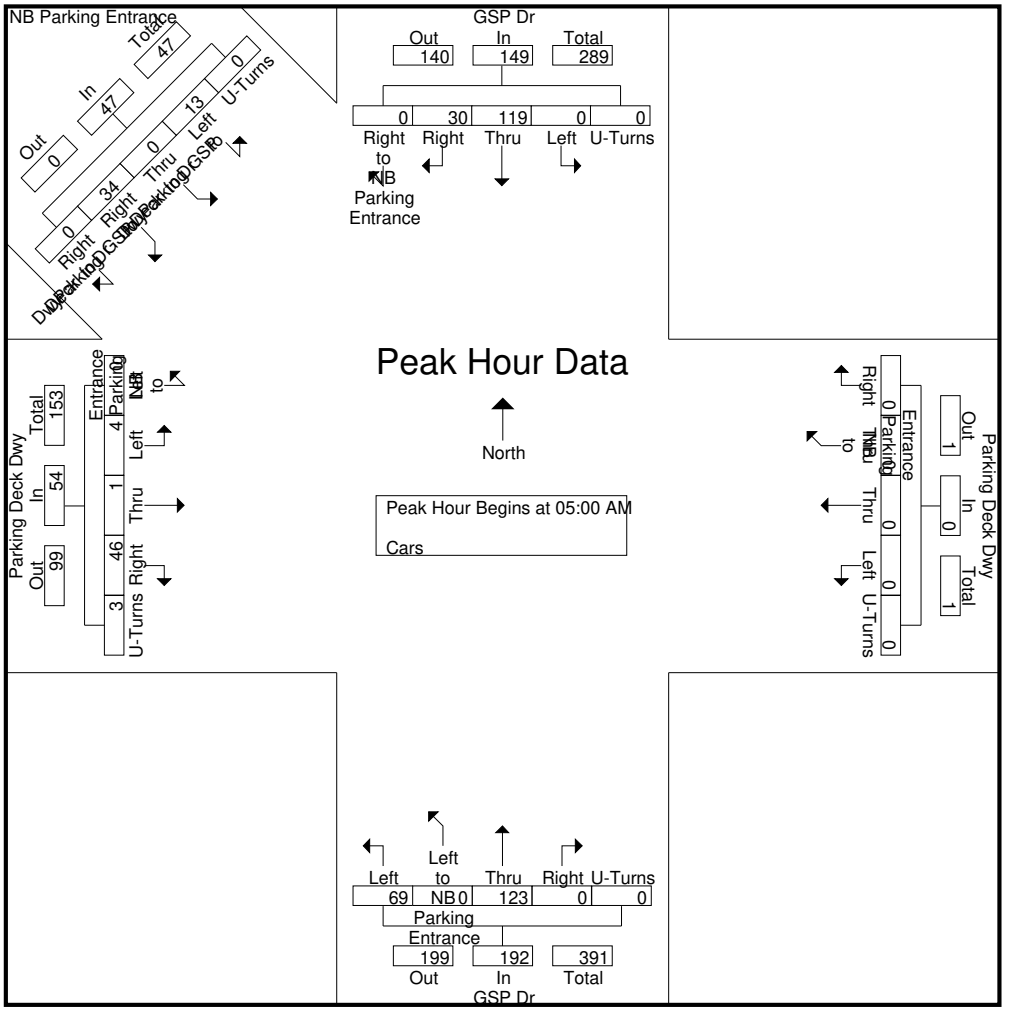


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 2

Start Time	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 05:00 AM																															
05:00 AM	0	7	29	0	0	36	0	0	0	0	0	0	0	32	0	13	0	45	11	0	1	0	0	12	0	4	0	**5**	0	9	102
05:15 AM	0	**8**	23	0	0	31	0	0	0	0	0	0	0	**34**	0	14	0	48	9	0	1	0	0	10	0	8	0	2	0	10	99
05:30 AM	0	8	**39**	0	0	**47**	0	0	0	0	0	0	0	31	0	18	0	49	**19**	**1**	**2**	0	1	**23**	0	**14**	0	4	0	**18**	**137**
05:45 AM	0	7	28	0	0	35	0	0	0	0	0	0	0	26	0	**24**	0	**50**	7	0	0	0	**2**	9	0	8	0	2	0	10	104
Total Volume	0	30	119	0	0	149	0	0	0	0	0	0	0	123	0	69	0	192	46	1	4	0	3	54	0	34	0	13	0	47	442
% App. Total	0	20.1	79.9	0	0		0	0	0	0	0		0	64.1	0	35.9	0		85.2	1.9	7.4	0	5.6		0	72.3	0	27.7	0		
PHF	.000	.938	.763	.000	.000	.793	.000	.000	.000	.000	.000	.000	.000	.904	.000	.719	.000	.960	.605	.250	.500	.000	.375	.587	.000	.607	.000	.650	.000	.653	.807

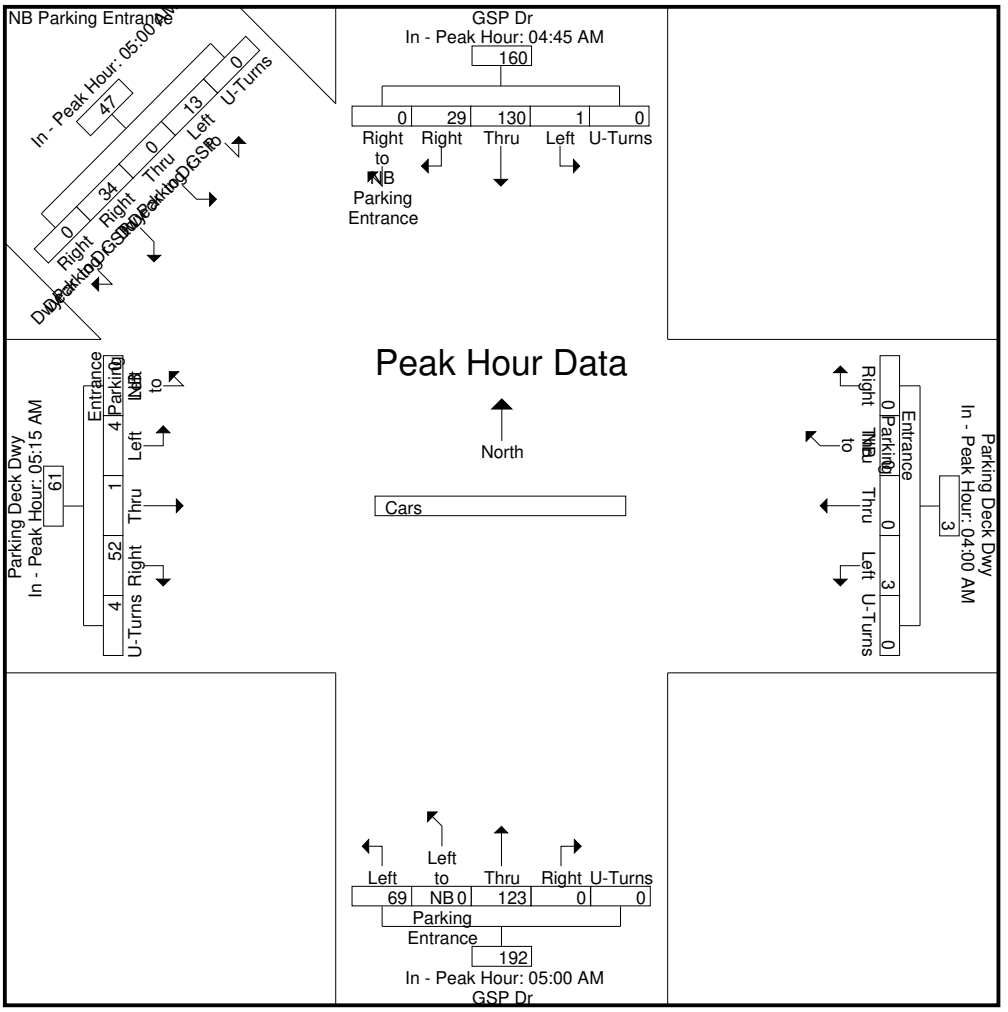


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 3

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																														
Peak Hour for Each Approach Begins at:																														
	04:45 AM						04:00 AM						05:00 AM						05:15 AM						05:00 AM						
+0 mins.	0	6	**39**	**1**	0	46	0	0	0	0	0	0	0	32	0	13	0	45	9	0	1	0	0	10	0	4	0	**5**	0	9	
+15 mins.	0	7	29	0	0	36	0	0	0	0	0	0	0	**34**	0	14	0	48	**19**	**1**	**2**	0	1	**23**	0	8	0	2	0	10	
+30 mins.	0	**8**	23	0	0	31	0	0	0	1	0	1	0	31	0	18	0	49	7	0	0	0	**2**	9	0	**14**	0	4	0	**18**	
+45 mins.	0	8	39	0	0	**47**	0	0	0	**2**	0	**2**	0	26	0	**24**	0	**50**	17	0	1	0	1	19	0	8	0	2	0	10	
Total Volume	0	29	130	1	0	160	0	0	0	3	0	3	0	123	0	69	0	192	52	1	4	0	4	61	0	34	0	13	0	47	
% App. Total	0	18.1	81.2	0.6	0		0	0	0	100	0		0	64.1	0	35.9	0		85.2	1.6	6.6	0	6.6		0	72.3	0	27.7	0		
PHF	.000	.906	.833	.250	.000	.851	.000	.000	.000	.375	.000	.375	.000	.904	.000	.719	.000	.960	.684	.250	.500	.000	.500	.663	.000	.607	.000	.650	.000	.653	



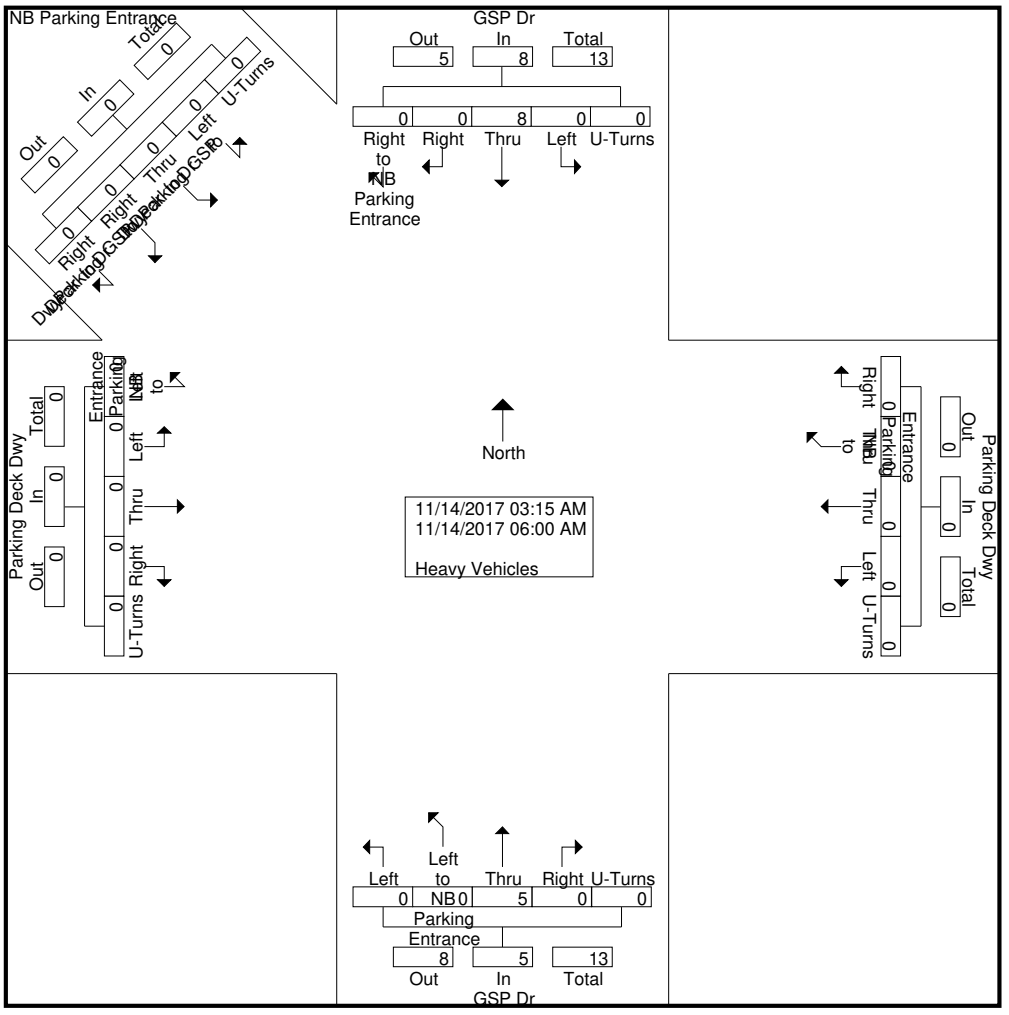
Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 1

Groups Printed- Heavy Vehicles

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
03:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
03:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 AM	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
05:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	5
05:30 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	2	0	0	2	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	6
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total																															
Apprch %			100											100																	
			61.5											38.5																	

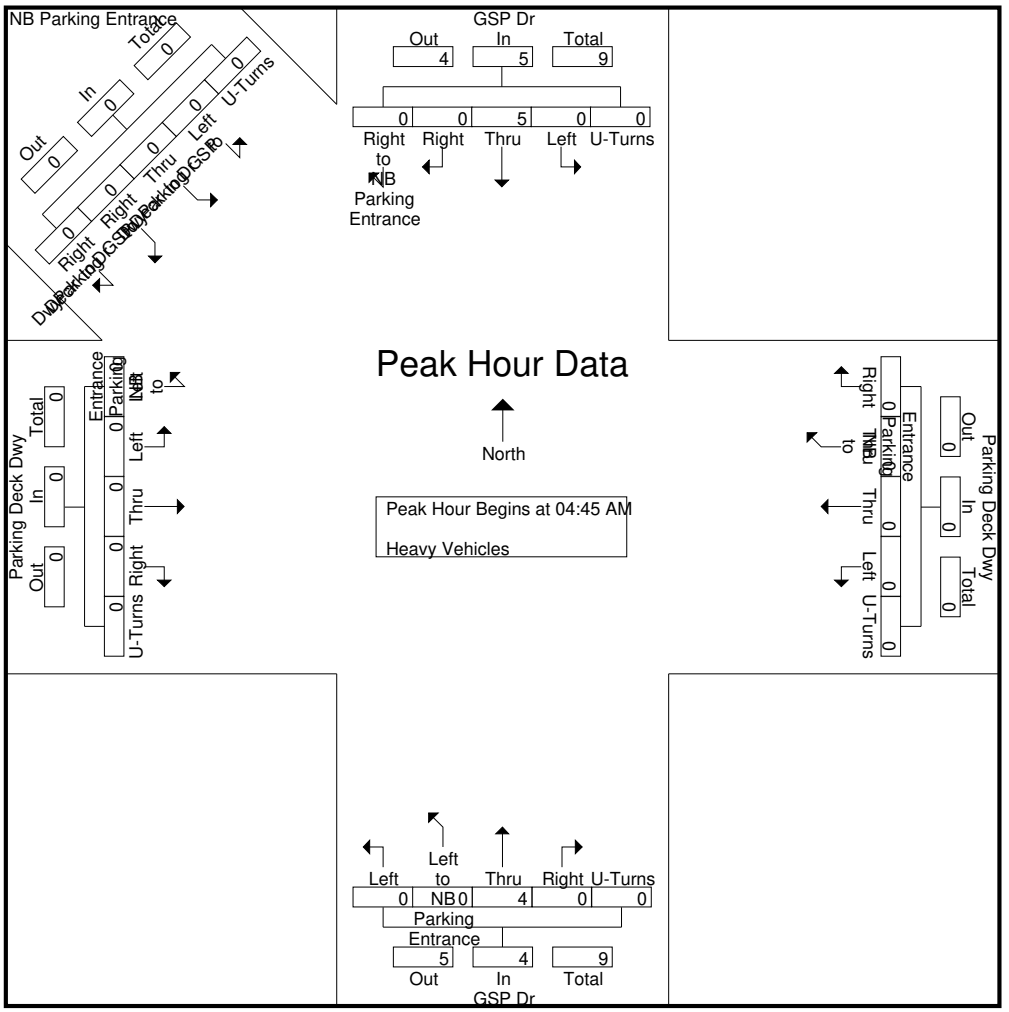


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 2

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																														
Peak Hour for Entire Intersection Begins at 04:45 AM																														
04:45 AM	0	0	**3**	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
05:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	**4**				**4**												**5**
05:30 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume																														
% App. Total	0	0	100	0	0		0	0	0	0	0		0	100	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.417	.000	.000	.417	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.450

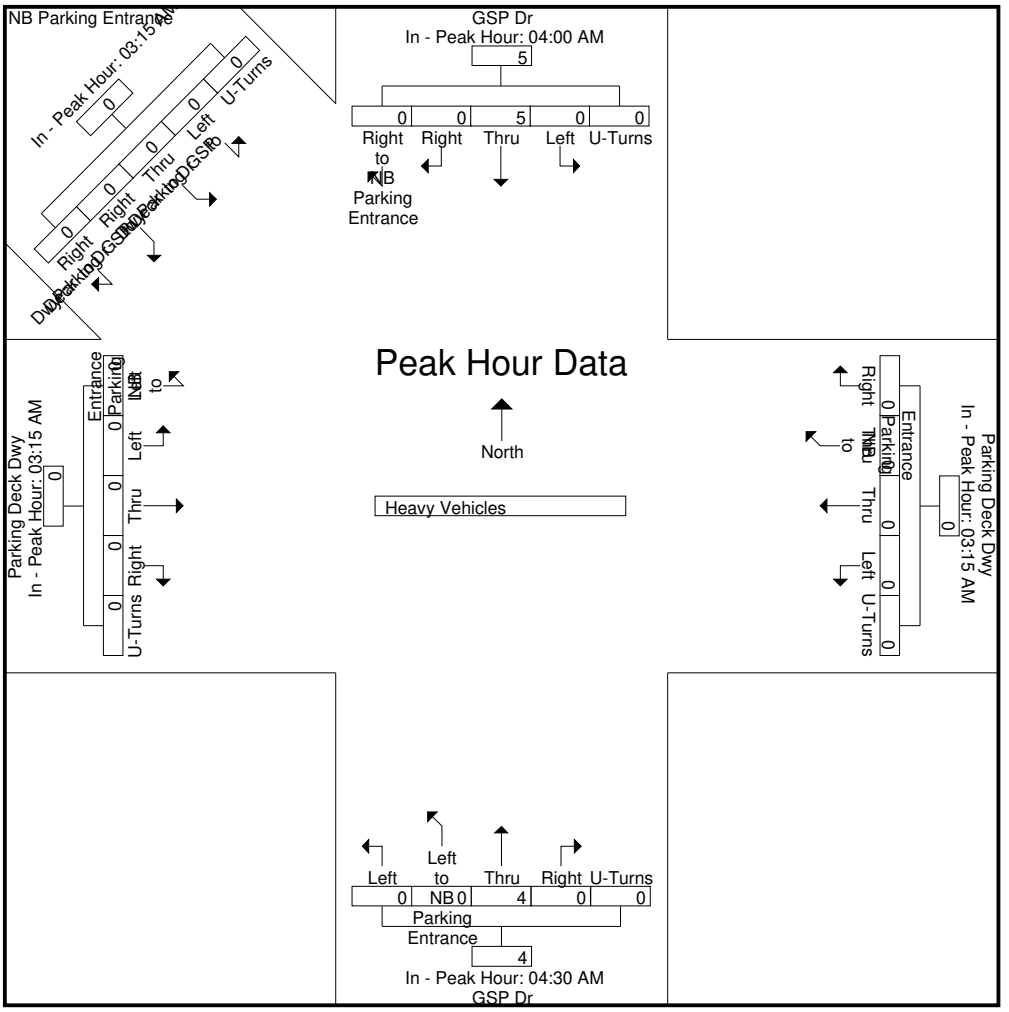


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 3

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	U-Turns	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	U-Turns	App. Total	Right	Thru	Left to NB Parking Entrance	Left	U-Turns	App. Total	Right	Thru	Left	Left to NB Parking Entrance	U-Turns	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	04:00 AM						03:15 AM						04:30 AM						03:15 AM						03:15 AM						
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+15 mins.	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+45 mins.	0	0	**3**	0	0	**3**	0	0	0	0	0	0	0	**4**	0	0	0	**4**	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	5	0	0	5	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	
% App. Total	0	0	100	0	0		0	0	0	0	0		0	100	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.417	.000	.000	.417	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	



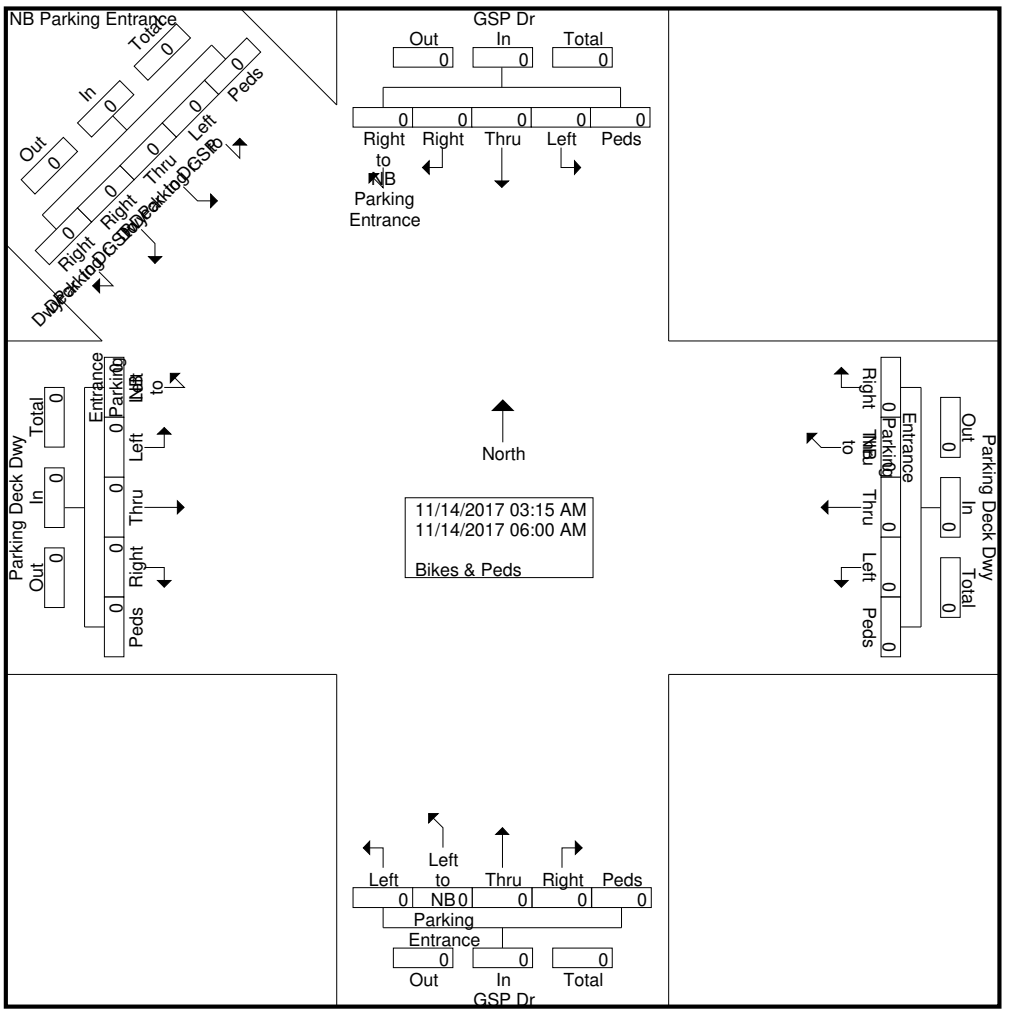
Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 1

Groups Printed- Bikes & Peds

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
03:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total																															
Apprch %																															

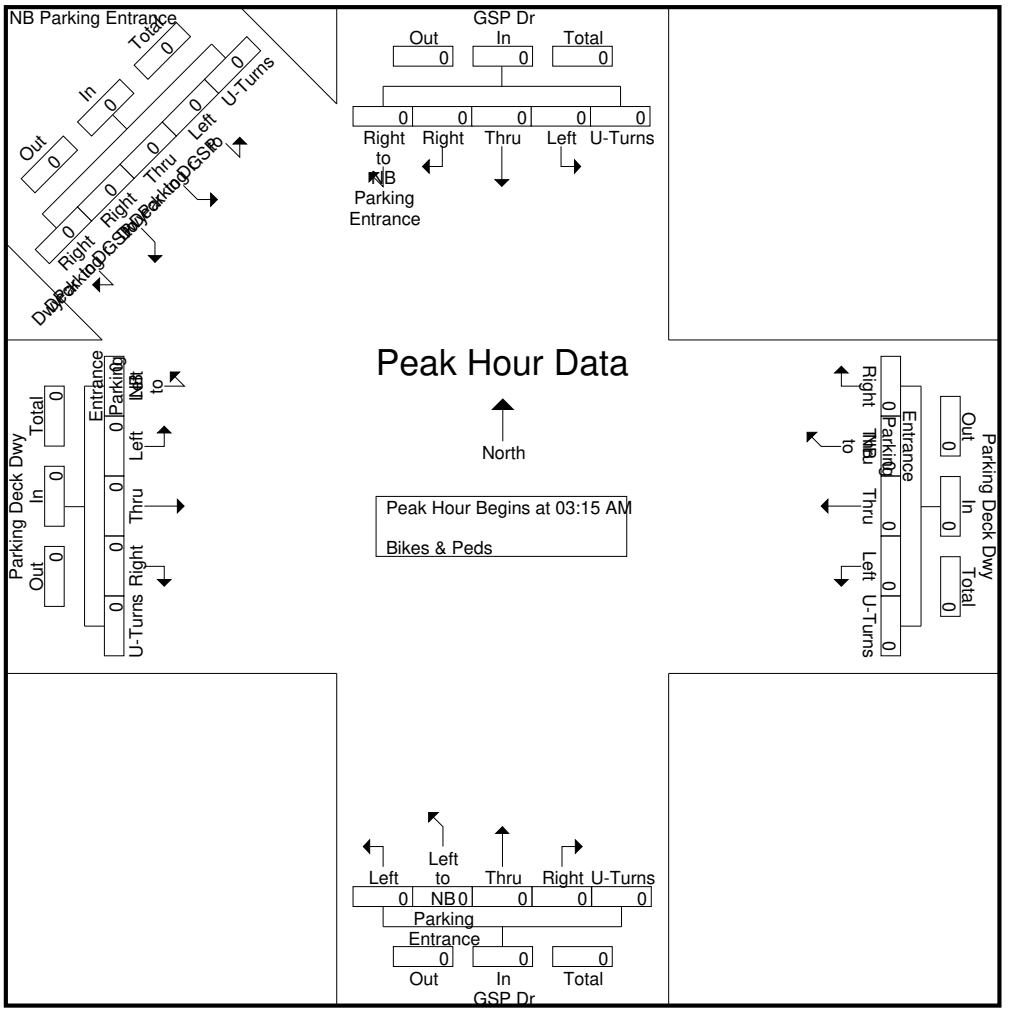


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 2

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 03:15 AM																															
03:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume																															
% App. Total	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

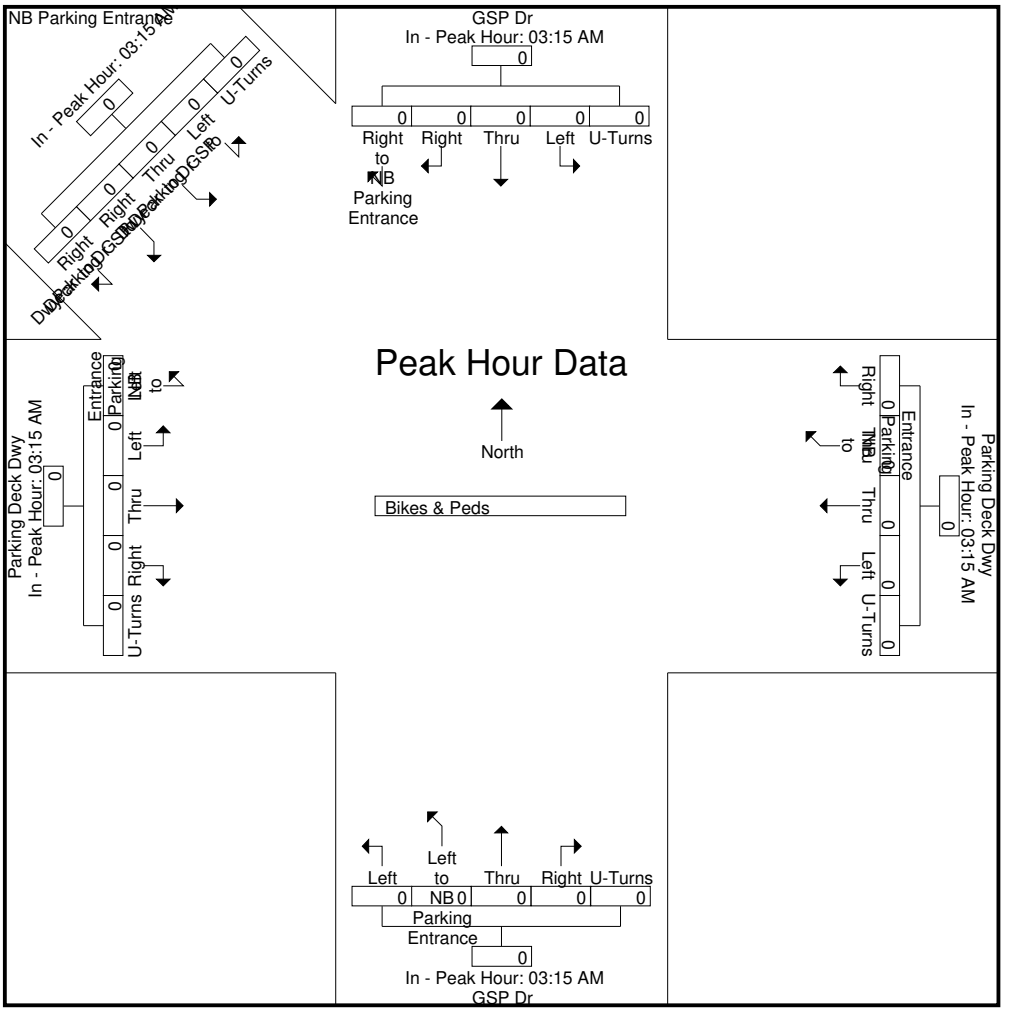


Quality Counts, LLC

920 Blairhill Rd, STE B106
Charlotte, NC 28217

File Name : 14557204
Site Code : 14557204
Start Date : 11/14/2017
Page No : 3

	GSP Dr Southbound						Parking Deck Dwy Westbound						GSP Dr Northbound						Parking Deck Dwy Eastbound						NB Parking Entrance Southeastbound						
Start Time	Right to NB Parking Entrance	Right	Thru	Left	Peds	App. Total	Right	Thru to NB Parking Entrance	Thru	Left	Peds	App. Total	Right	Thru	Left to NB Parking Entrance	Left	Peds	App. Total	Right	Thru	Left	Left to NB Parking Entrance	Peds	App. Total	Right to Parking Deck Dwy	Right to GSP Dr	Thru to Parking Deck Dwy	Left to GSP Dr	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:15 AM to 06:00 AM - Peak 1 of 1																															
Peak Hour for Each Approach Begins at:																															
	03:15 AM						03:15 AM						03:15 AM						03:15 AM						03:15 AM						
+0 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+15 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+30 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
+45 mins.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
% App. Total	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	



Type of peak hour being reported: Intersection Peak

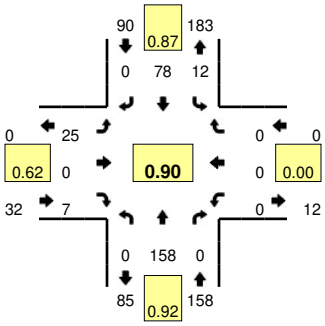
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Aviation Pkwy SB

CITY/STATE: Greer, SC

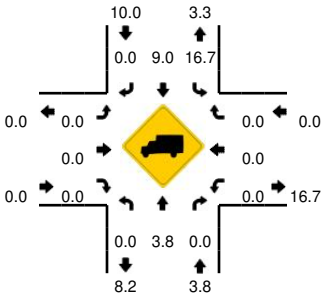
QC JOB #: 14557205

DATE: Tue, Nov 14 2017

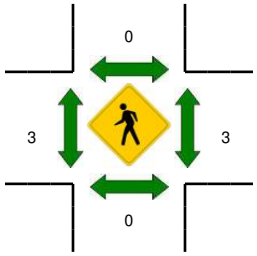


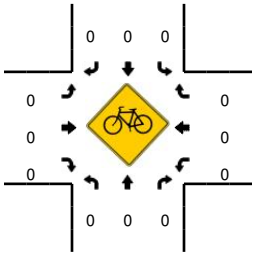
Peak-Hour: 8:45 AM -- 9:45 AM

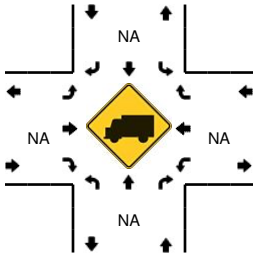
Peak 15-Min: 9:30 AM -- 9:45 AM

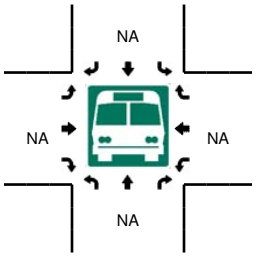


Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES









15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Aviation Pkwy SB (Eastbound)				Aviation Pkwy SB (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:45 AM	0	58	1	0	0	17	0	0	3	1	1	0	0	0	0	0	81	
7:00 AM	0	31	0	0	1	11	0	0	1	0	0	0	0	0	0	0	44	
7:15 AM	0	27	2	0	7	16	0	0	1	0	0	0	0	0	0	0	53	
7:30 AM	0	27	1	0	13	26	0	0	1	0	0	0	0	0	0	0	68	246
7:45 AM	0	23	2	1	15	34	0	0	1	0	0	0	0	0	0	0	76	241
8:00 AM	0	26	0	0	20	29	0	0	0	0	2	0	0	0	0	0	77	274
8:15 AM	0	16	1	0	7	25	0	1	1	0	0	0	0	0	0	0	51	272
8:30 AM	0	31	0	0	5	26	0	0	2	1	2	0	0	0	0	0	67	271
8:45 AM	0	36	0	0	4	21	0	0	2	0	1	0	0	0	0	0	64	259
9:00 AM	0	38	0	0	2	18	0	0	4	0	2	0	0	0	0	0	64	246
9:15 AM	0	43	0	0	1	17	0	0	11	0	2	0	0	0	0	0	74	269
9:30 AM	0	41	0	0	5	22	0	0	8	0	2	0	0	0	0	0	78	280

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	164	0	0	20	88	0	0	32	0	8	0	0	0	0	0	312
Heavy Trucks	0	4	0		0	12	0		0	0	0		0	0	0		16
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

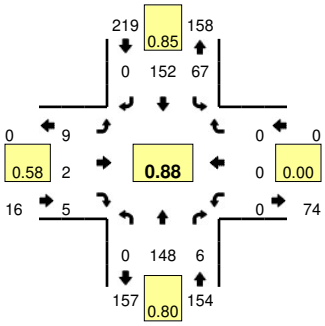
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Aviation Pkwy SB

QC JOB #: 14557206

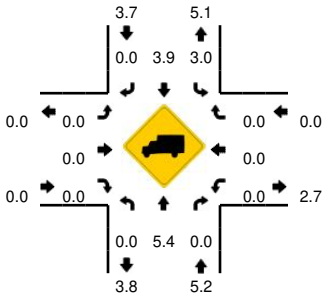
CITY/STATE: Greer, SC

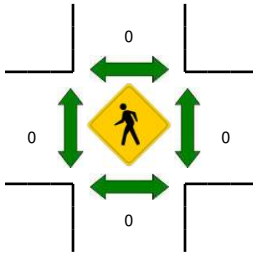
DATE: Tue, Nov 14 2017

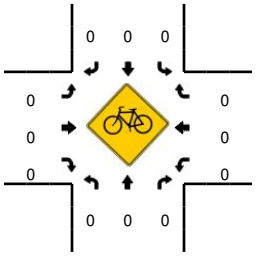


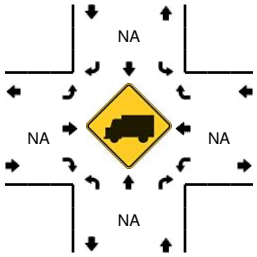
Peak-Hour: 4:30 PM -- 5:30 PM

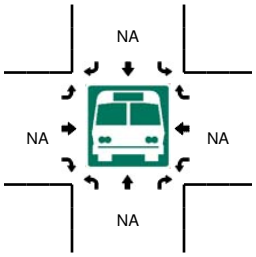
Peak 15-Min: 4:30 PM -- 4:45 PM











15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Aviation Pkwy SB (Eastbound)				Aviation Pkwy SB (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:15 PM	0	35	0	0	8	23	0	0	2	2	3	0	0	0	0	0	73	
3:30 PM	0	49	0	0	13	30	0	0	3	0	3	0	0	0	0	0	98	
3:45 PM	0	33	1	0	25	25	0	0	2	2	1	0	0	0	0	0	89	
4:00 PM	0	20	1	0	13	31	0	0	1	0	1	0	0	0	0	0	67	327
4:15 PM	0	32	0	0	11	39	0	0	4	1	0	0	0	0	0	0	87	341
4:30 PM	0	46	2	0	15	37	0	1	5	1	3	0	0	0	0	0	110	353
4:45 PM	0	27	1	0	18	49	0	0	2	0	0	0	0	0	0	0	97	361
5:00 PM	0	37	1	0	14	35	0	0	2	1	1	0	0	0	0	0	91	385
5:15 PM	0	38	2	0	19	31	0	0	0	0	1	0	0	0	0	0	91	389
5:30 PM	0	33	2	0	17	46	0	0	0	0	1	0	0	0	0	0	99	378
5:45 PM	0	28	0	0	11	34	0	0	0	0	2	0	0	0	0	0	75	356
6:00 PM	0	11	0	0	7	31	0	0	0	0	0	0	0	0	0	0	49	314

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	184	8	0	60	148	0	4	20	4	12	0	0	0	0	0	440
Heavy Trucks	0	4	0		0	4	0		0	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

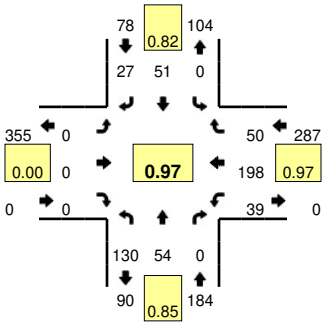
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Aviation Pkwy NB

CITY/STATE: Greer, SC

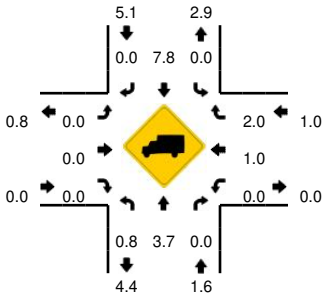
QC JOB #: 14557207

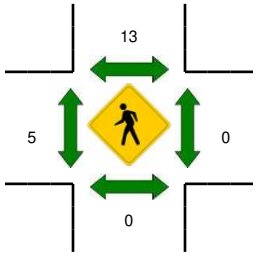
DATE: Tue, Nov 14 2017

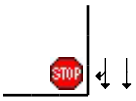


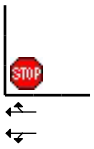
Peak-Hour: 8:45 AM -- 9:45 AM

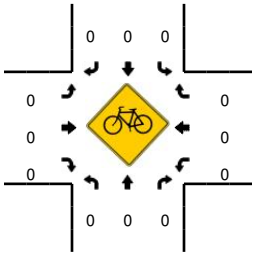
Peak 15-Min: 9:15 AM -- 9:30 AM

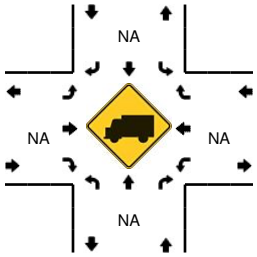


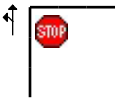


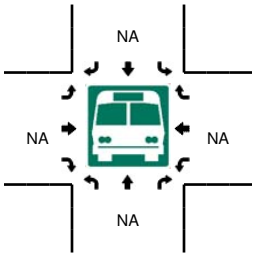












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Aviation Pkwy NB (Eastbound)				Aviation Pkwy NB (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:45 AM	30	33	0	0	0	10	5	0	0	0	0	0	5	41	22	0	146	
7:00 AM	13	19	0	0	0	8	5	0	0	0	0	0	5	41	15	0	106	
7:15 AM	16	12	0	0	0	19	2	0	0	0	0	0	7	13	5	0	74	
7:30 AM	6	16	0	0	0	29	2	0	0	0	0	0	4	5	8	0	70	396
7:45 AM	8	17	0	0	0	44	3	0	0	0	0	0	7	7	5	0	91	341
8:00 AM	8	19	0	0	0	41	3	0	0	0	0	0	5	12	5	0	93	328
8:15 AM	9	9	0	0	0	26	6	0	0	0	0	0	9	13	5	0	77	331
8:30 AM	21	11	0	0	0	20	6	0	0	0	0	0	10	21	8	0	97	358
8:45 AM	26	13	0	0	0	13	10	0	0	0	0	0	13	37	20	0	132	399
9:00 AM	29	14	0	0	0	16	9	0	0	0	0	0	6	51	13	0	138	444
9:15 AM	40	14	0	0	0	11	3	0	0	0	0	0	6	59	8	0	141	508
9:30 AM	35	13	0	0	0	11	5	0	0	0	0	0	14	51	9	0	138	549

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	160	56	0	0	0	44	12	0	0	0	0	0	24	236	32	0	564
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	4	0		4
Pedestrians		0				12				4				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

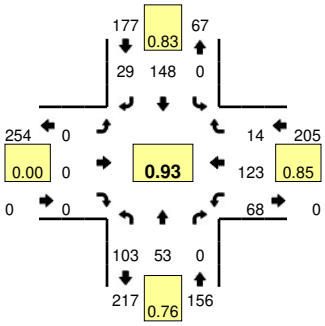
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Aviation Pkwy NB

CITY/STATE: Greer, SC

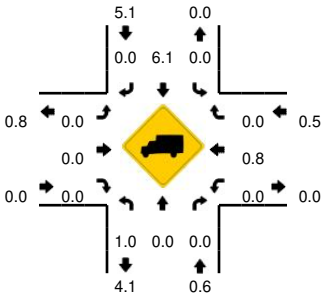
QC JOB #: 14557208

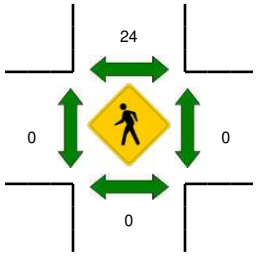
DATE: Tue, Nov 14 2017

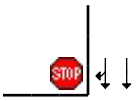


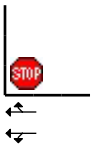
Peak-Hour: 4:15 PM -- 5:15 PM

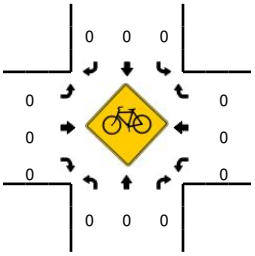
Peak 15-Min: 4:30 PM -- 4:45 PM

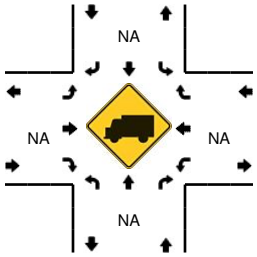


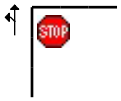


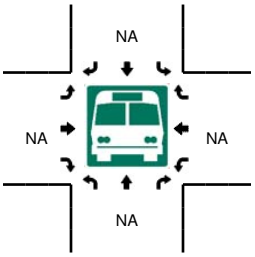












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Aviation Pkwy NB (Eastbound)				Aviation Pkwy NB (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:15 PM	25	13	0	0	0	17	8	0	0	0	0	0	11	43	8	0	125	
3:30 PM	39	14	0	0	0	32	13	0	0	0	0	0	11	39	10	0	158	
3:45 PM	19	16	0	0	0	40	6	0	0	0	0	0	9	31	1	0	122	
4:00 PM	20	3	0	0	0	25	3	0	0	0	0	0	17	25	7	0	100	505
4:15 PM	25	13	0	0	0	32	8	0	0	0	0	0	16	34	3	0	131	511
4:30 PM	35	16	0	0	0	40	4	0	0	0	0	0	13	33	4	0	145	498
4:45 PM	20	8	0	1	0	48	9	0	0	0	0	0	21	26	5	0	138	514
5:00 PM	22	16	0	0	0	28	8	0	0	0	0	0	18	30	2	0	124	538
5:15 PM	25	13	0	0	0	38	7	0	0	0	0	0	11	25	3	0	122	529
5:30 PM	20	13	0	0	0	47	13	0	0	0	0	0	15	30	2	0	140	524
5:45 PM	16	12	0	0	0	34	5	0	0	0	0	0	12	19	5	0	103	489
6:00 PM	8	4	0	0	0	33	1	0	0	0	0	0	4	22	3	0	75	440

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	140	64	0	0	0	160	16	0	0	0	0	0	52	132	16	0	580
Heavy Trucks	0	0	0		0	4	0		0	0	0		0	0	0		4
Pedestrians		0				36				0				0			36
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

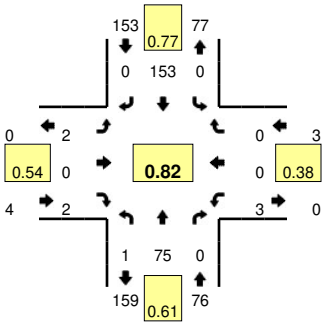
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Parking Lot Dwys

QC JOB #: 14557209

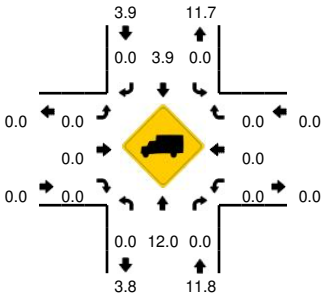
CITY/STATE: Greer, SC

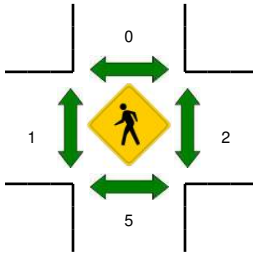
DATE: Tue, Nov 14 2017

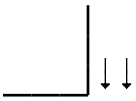


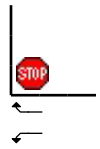
Peak-Hour: 7:30 AM -- 8:30 AM

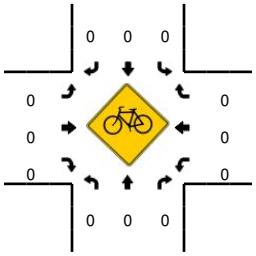
Peak 15-Min: 7:45 AM -- 8:00 AM

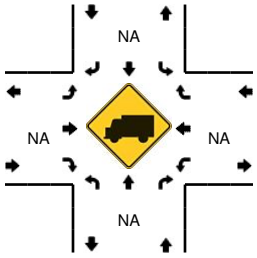


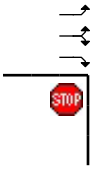


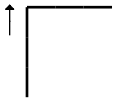


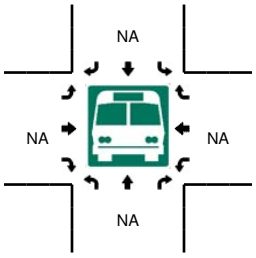












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Parking Lot Dwys (Eastbound)				Parking Lot Dwys (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:45 AM	0	43	0	1	0	10	0	0	0	0	4	0	0	0	0	0	58	
7:00 AM	0	26	0	1	0	15	0	0	0	0	0	0	0	0	0	0	42	
7:15 AM	0	14	0	0	0	19	0	0	0	0	3	0	0	0	0	0	36	
7:30 AM	0	22	0	0	0	29	0	0	1	0	0	0	1	0	0	0	53	189
7:45 AM	0	22	0	0	0	50	0	0	0	0	0	0	0	0	0	0	72	203
8:00 AM	0	21	0	1	0	46	0	0	1	0	0	0	0	0	0	0	69	230
8:15 AM	0	10	0	0	0	28	0	0	0	0	2	0	2	0	0	0	42	236
8:30 AM	0	14	0	0	0	26	0	0	0	0	1	0	0	0	0	0	41	224
8:45 AM	0	24	0	0	0	22	0	0	0	0	2	0	0	0	0	0	48	200
9:00 AM	0	12	0	2	0	20	0	0	0	0	3	0	0	0	0	0	37	168
9:15 AM	0	16	0	0	0	11	0	0	1	0	2	0	0	0	0	0	30	156
9:30 AM	0	19	0	1	0	14	0	0	1	0	6	0	1	0	0	0	42	157

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	88	0	0	0	200	0	0	0	0	0	0	0	0	0	0	288
Heavy Trucks	0	8	0		0	4	0		0	0	0		0	0	0		12
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

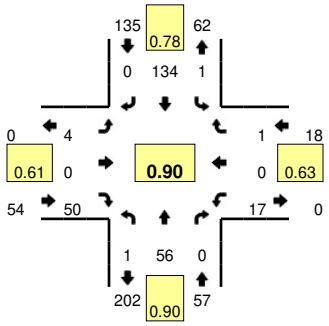
Comments:

Report generated on 11/27/2017 12:10 PM

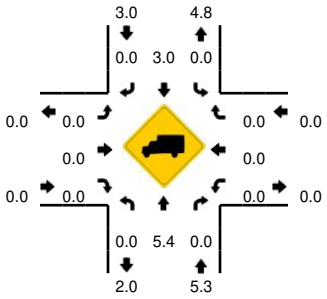
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

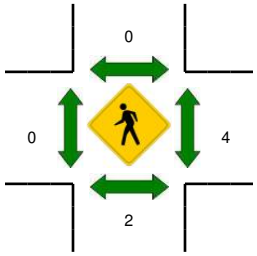
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

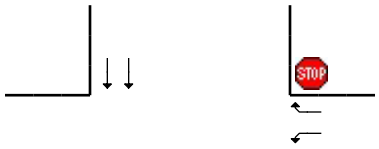
LOCATION: GSP Dr -- Parking Lot Dwys | **QC JOB #:** 14557210
CITY/STATE: Greer, SC | **DATE:** Tue, Nov 14 2017

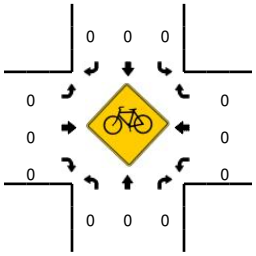


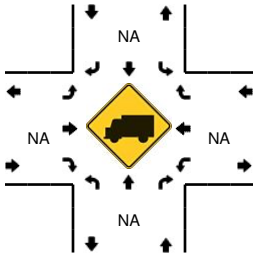
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

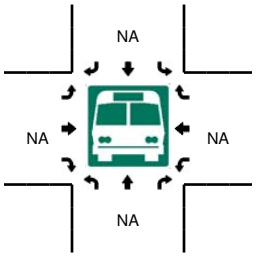












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Parking Lot Dwys (Eastbound)				Parking Lot Dwys (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:15 PM	0	16	0	0	0	22	0	0	2	0	4	0	4	0	2	0	50	
3:30 PM	0	20	0	1	0	22	0	0	2	0	15	0	5	0	1	0	66	
3:45 PM	0	15	0	0	0	20	0	0	0	0	17	0	10	0	2	0	64	
4:00 PM	0	4	0	0	0	21	0	0	0	0	3	0	5	0	1	0	34	214
4:15 PM	0	10	0	0	0	32	0	0	0	0	3	0	4	0	0	0	49	213
4:30 PM	0	17	0	0	0	29	0	0	1	0	10	0	7	0	0	0	64	211
4:45 PM	0	13	0	0	0	43	0	0	0	0	14	0	3	0	0	0	73	220
5:00 PM	0	16	0	0	0	27	0	1	1	0	4	0	2	0	1	0	52	238
5:15 PM	0	15	0	0	0	23	0	0	2	0	20	0	6	0	0	0	66	255
5:30 PM	0	12	0	1	0	41	0	0	1	0	12	0	6	0	0	0	73	264
5:45 PM	0	17	0	0	0	30	0	0	1	0	1	0	5	0	0	0	54	245
6:00 PM	0	7	0	0	0	27	0	0	1	0	6	0	2	0	0	0	43	236

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	52	0	0	0	172	0	0	0	0	56	0	12	0	0	0	292
Heavy Trucks	0	0	0		0	8	0		0	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

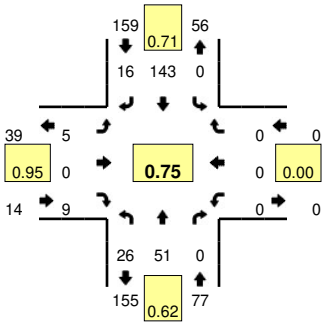
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Airport/FAA Offices Dwy

CITY/STATE: Greer, SC

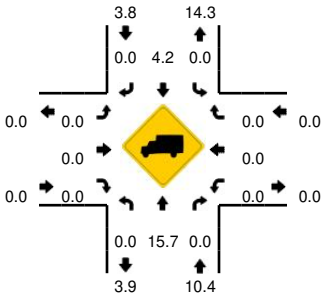
QC JOB #: 14557211

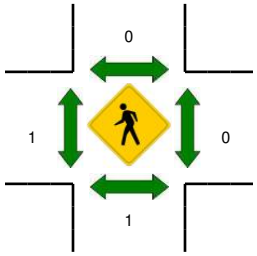
DATE: Tue, Nov 14 2017

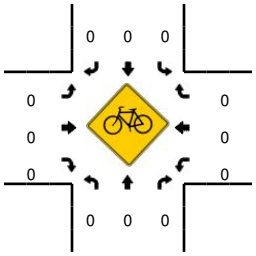


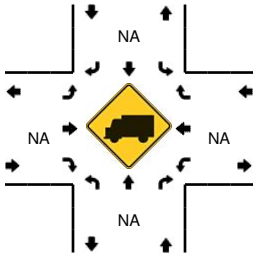
Peak-Hour: 7:30 AM -- 8:30 AM

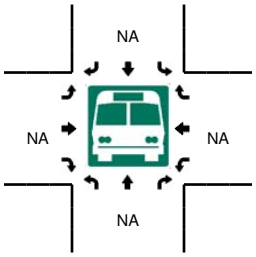
Peak 15-Min: 7:45 AM -- 8:00 AM











15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Airport/FAA Offices Dwy (Eastbound)				Airport/FAA Offices Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:45 AM	5	39	0	0	0	8	7	1	0	0	2	0	0	0	0	0	62	
7:00 AM	3	23	0	2	0	11	2	0	2	0	2	0	0	0	0	0	45	
7:15 AM	4	8	0	2	0	14	2	0	0	0	3	0	0	0	0	0	33	
7:30 AM	7	15	0	1	0	29	3	0	0	0	0	0	0	0	0	0	55	195
7:45 AM	9	12	0	1	0	47	9	0	2	0	3	0	0	0	0	0	83	216
8:00 AM	5	14	0	0	0	42	3	0	1	0	3	0	0	0	0	0	68	239
8:15 AM	2	10	0	1	0	25	1	0	2	0	3	0	0	0	0	0	44	250
8:30 AM	3	10	0	0	0	24	2	0	3	0	2	0	0	0	0	0	44	239
8:45 AM	8	12	0	2	0	16	2	0	1	0	3	0	0	0	0	0	44	200
9:00 AM	6	7	0	1	0	18	1	0	0	0	1	0	0	0	0	0	34	166
9:15 AM	6	12	0	0	0	11	2	0	3	0	0	0	0	0	0	0	34	156
9:30 AM	2	13	0	3	0	6	3	0	0	0	4	0	0	0	0	0	31	143

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	36	48	0	4	0	188	36	0	8	0	12	0	0	0	0	0	332
Heavy Trucks	0	8	0		0	4	0		0	0	0		0	0	0		12
Pedestrians		4				0				4				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

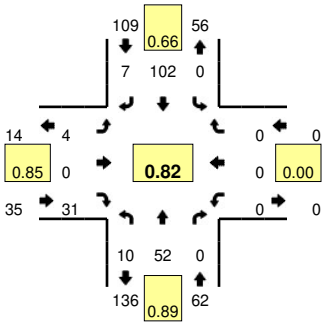
Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Airport/FAA Offices Dwy

CITY/STATE: Greer, SC

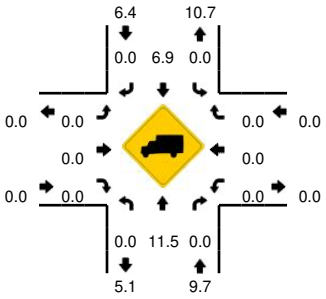
QC JOB #: 14557212

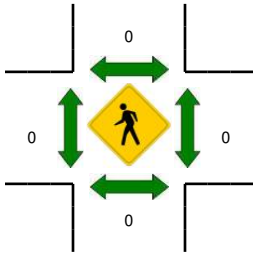
DATE: Tue, Nov 14 2017

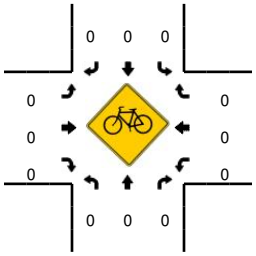


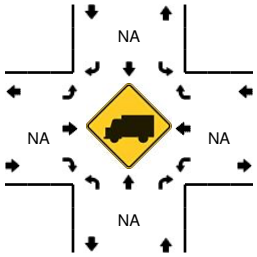
Peak-Hour: 4:45 PM -- 5:45 PM

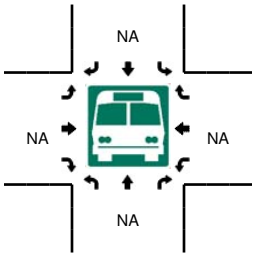
Peak 15-Min: 4:45 PM -- 5:00 PM











15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Airport/FAA Offices Dwy (Eastbound)				Airport/FAA Offices Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:15 PM	7	11	0	3	0	13	1	1	1	0	5	0	0	0	0	0	42	
3:30 PM	4	18	0	1	0	16	1	0	1	0	6	0	0	0	0	0	47	
3:45 PM	1	14	0	0	0	14	0	0	3	0	6	0	0	0	0	0	38	
4:00 PM	1	4	0	2	0	14	0	0	2	0	5	0	0	0	0	0	28	155
4:15 PM	3	7	0	1	0	21	1	0	0	0	10	0	0	0	0	0	43	156
4:30 PM	3	14	0	2	0	17	1	0	3	0	10	0	0	0	0	0	50	159
4:45 PM	1	10	0	1	0	35	6	0	1	0	9	0	0	0	0	0	63	184
5:00 PM	1	17	0	1	0	16	1	0	1	0	10	0	0	0	0	0	47	203
5:15 PM	1	14	0	1	0	18	0	0	2	0	3	0	0	0	0	0	39	199
5:30 PM	4	11	0	0	0	33	0	0	0	0	9	0	0	0	0	0	57	206
5:45 PM	8	10	0	0	0	25	1	0	1	0	5	0	0	0	0	0	50	193
6:00 PM	3	4	0	1	0	17	1	0	3	0	9	0	0	0	0	0	38	184

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	40	0	4	0	140	24	0	4	0	36	0	0	0	0	0	252
Heavy Trucks	0	4	0		0	20	0		0	0	0		0	0	0		24
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: GSP Dr -- Stevens Rd

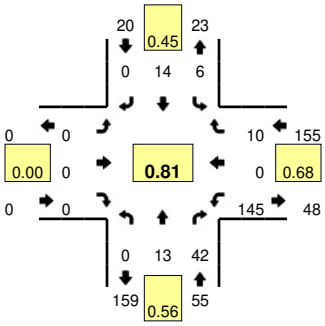
CITY/STATE: Greer, SC

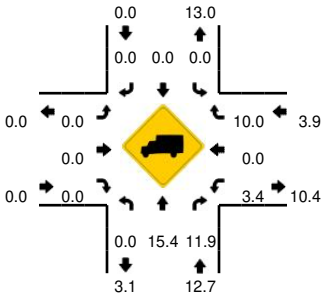
QC JOB #: 14557213

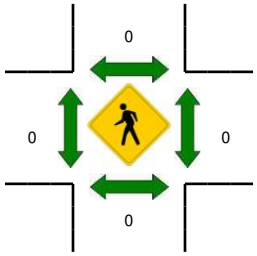
DATE: Tue, Nov 14 2017

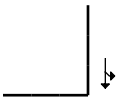
Peak-Hour: 7:30 AM -- 8:30 AM

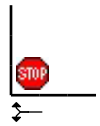
Peak 15-Min: 7:45 AM -- 8:00 AM

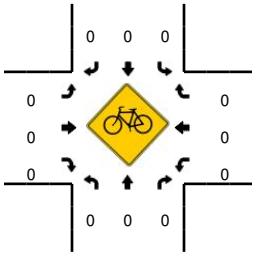


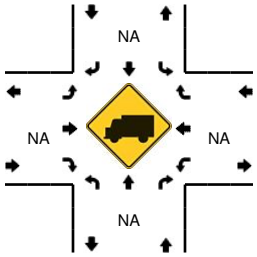


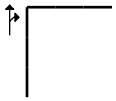


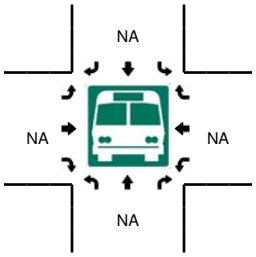












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Stevens Rd (Eastbound)				Stevens Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:45 AM	0	25	14	0	1	1	0	0	0	0	0	0	12	0	12	0	65	
7:00 AM	0	13	11	0	0	0	0	0	0	0	0	0	11	0	5	0	40	
7:15 AM	0	1	7	0	0	7	0	0	0	0	0	0	10	0	3	0	28	
7:30 AM	0	1	15	0	3	11	0	0	0	0	0	0	22	0	0	0	52	185
7:45 AM	0	2	10	0	0	1	0	0	0	0	0	0	54	0	4	0	71	191
8:00 AM	0	4	11	0	2	1	0	0	0	0	0	0	44	0	4	0	66	217
8:15 AM	0	6	6	0	1	1	0	0	0	0	0	0	25	0	2	0	41	230
8:30 AM	0	4	9	0	1	2	0	0	0	0	0	0	25	0	0	0	41	219
8:45 AM	0	6	6	0	1	5	0	0	0	0	0	0	16	0	1	0	35	183
9:00 AM	0	2	4	1	2	8	0	0	0	0	0	0	8	0	5	0	30	147
9:15 AM	0	4	9	0	1	2	0	0	0	0	0	0	11	0	5	0	32	138
9:30 AM	0	6	9	0	0	4	0	0	0	0	0	0	6	0	1	0	26	123

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	8	40	0	0	4	0	0	0	0	0	0	216	0	16	0	284
Heavy Trucks	0	0	4		0	0	0		0	0	0		0	0	0		4
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

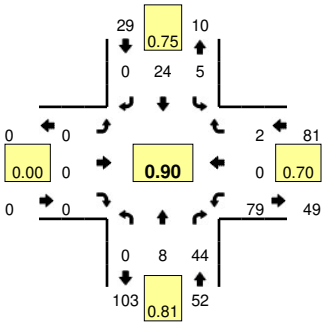
Type of peak hour being reported: Intersection Peak

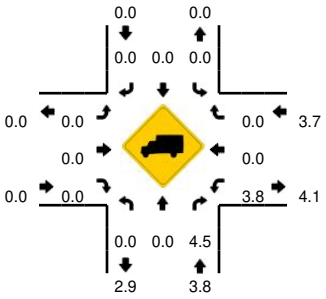
Method for determining peak hour: Total Entering Volume

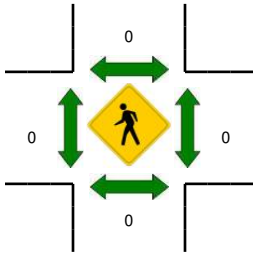
LOCATION: GSP Dr -- Stevens Rd
CITY/STATE: Greer, SC

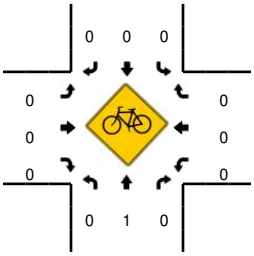
QC JOB #: 14557214
DATE: Tue, Nov 14 2017

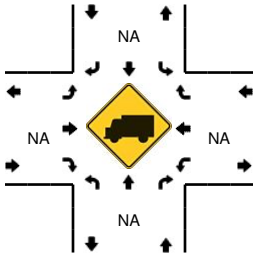
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

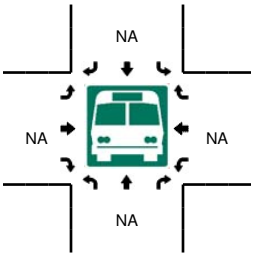












15-Min Count Period Beginning At	GSP Dr (Northbound)				GSP Dr (Southbound)				Stevens Rd (Eastbound)				Stevens Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:15 PM	0	2	12	0	7	5	0	0	0	0	0	0	11	0	0	0	37	
3:30 PM	0	2	17	0	6	9	0	0	0	0	0	0	7	0	0	0	41	
3:45 PM	0	4	13	0	6	3	0	0	0	0	0	0	11	0	1	0	38	
4:00 PM	0	3	2	1	4	5	0	0	0	0	0	0	8	0	0	0	23	139
4:15 PM	0	3	2	0	4	4	0	0	0	0	0	0	16	0	0	0	29	131
4:30 PM	0	2	15	0	5	8	0	0	0	0	0	0	12	0	0	0	42	132
4:45 PM	0	2	6	0	2	13	0	0	0	0	0	0	22	0	0	0	45	139
5:00 PM	0	4	14	0	2	3	0	0	0	0	0	0	14	0	0	0	37	153
5:15 PM	0	2	13	0	1	4	0	0	0	0	0	0	16	0	0	0	36	160
5:30 PM	0	0	11	0	0	4	0	0	0	0	0	0	27	0	2	0	44	162
5:45 PM	0	2	9	0	4	8	0	0	0	0	0	0	17	0	0	0	40	157
6:00 PM	0	3	4	0	2	6	0	0	0	0	0	0	12	0	1	0	28	148

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	8	24	0	8	52	0	0	0	0	0	0	88	0	0	0	180
Heavy Trucks	0	0	0		0	0	0		0	0	0		4	0	0		4
Pedestrians		0				0				0				0			0
Bicycles	0	1	0		0	0	0		0	0	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 11/27/2017 12:10 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE
APPENDIX C: COMMUNITY SURVEY ANALYSIS

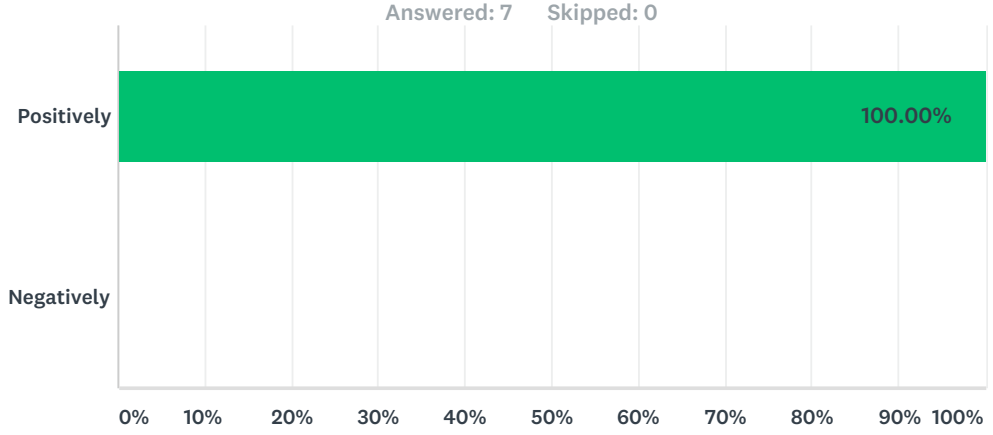
McFarland Johnson

Q1 How would you describe the airport's benefit to the community?

Answered: 7 Skipped: 0

Q2 How do you feel the airport impacts the community overall?

Answered: 7 Skipped: 0

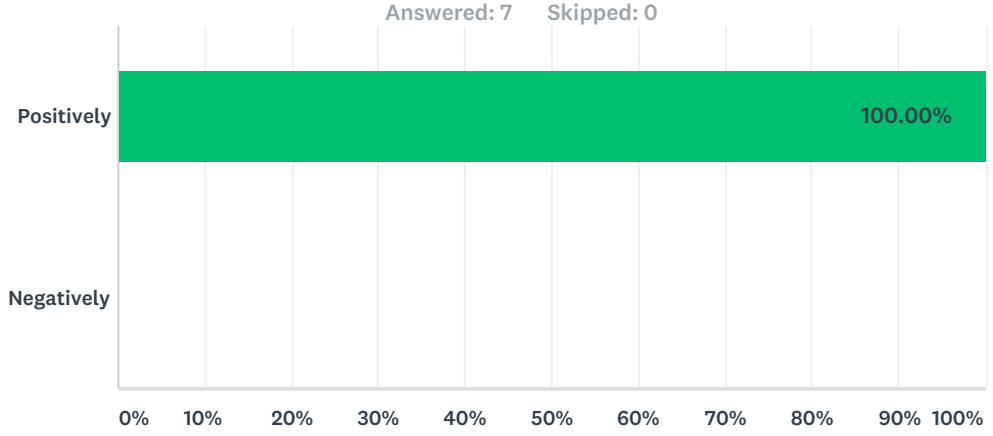


Q3 Please explain

Answered: 6 Skipped: 1

Q4 How do you feel the airport impacts local businesses?

Answered: 7 Skipped: 0

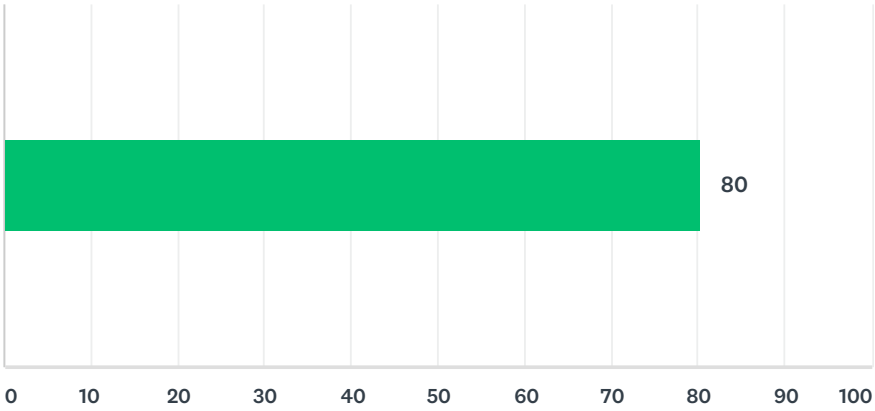


Q5 Please explain

Answered: 6 Skipped: 1

Q6 How do you feel the airport represents the community?

Answered: 7 Skipped: 0

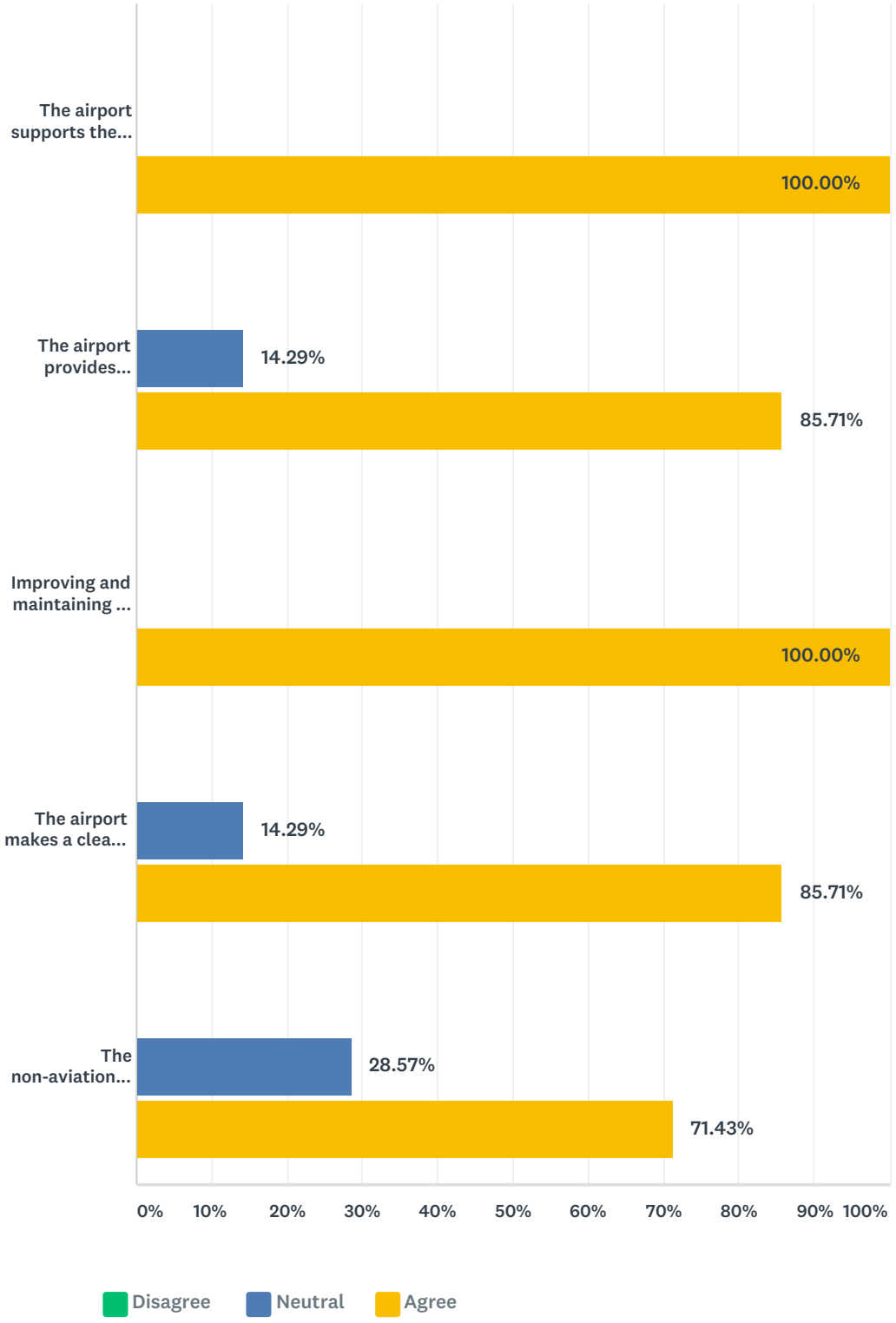


Q7 Please explain.

Answered: 5 Skipped: 2

Q8 Please indicate the level to which you agree with each of the following statements.

Answered: 7 Skipped: 0

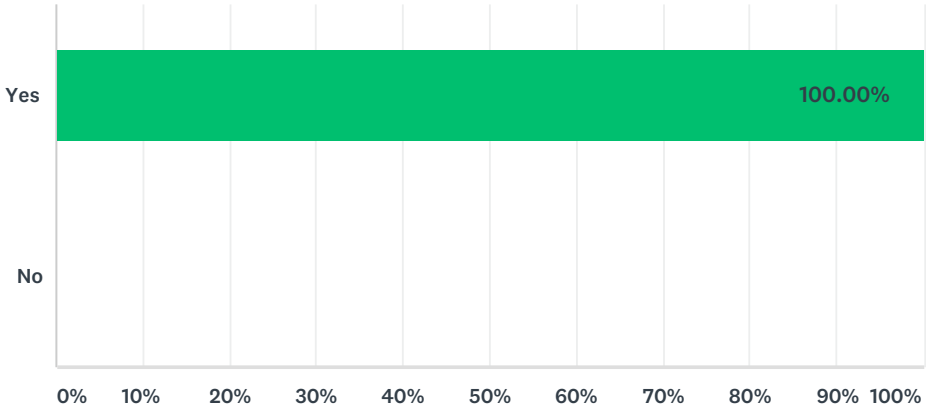


Q9 Please explain items that can be improved.

Answered: 3 Skipped: 4

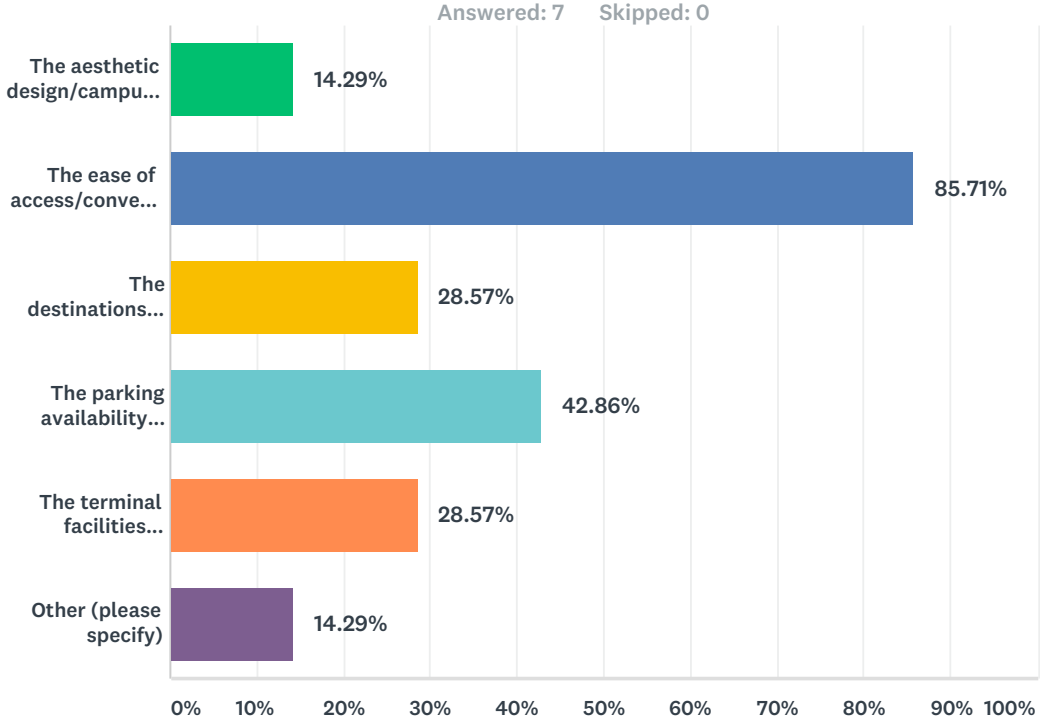
Q10 Do you prefer using GSP over other airports in the region?

Answered: 7 Skipped: 0



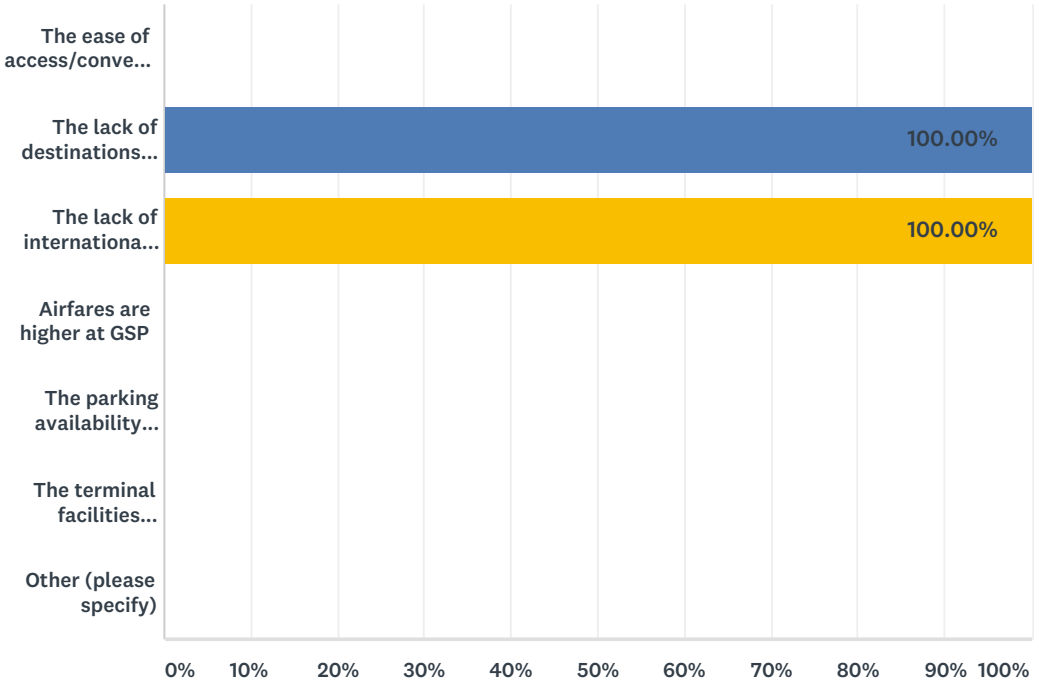
Q11 If yes, what aspects contribute to this preference?

Answered: 7 Skipped: 0



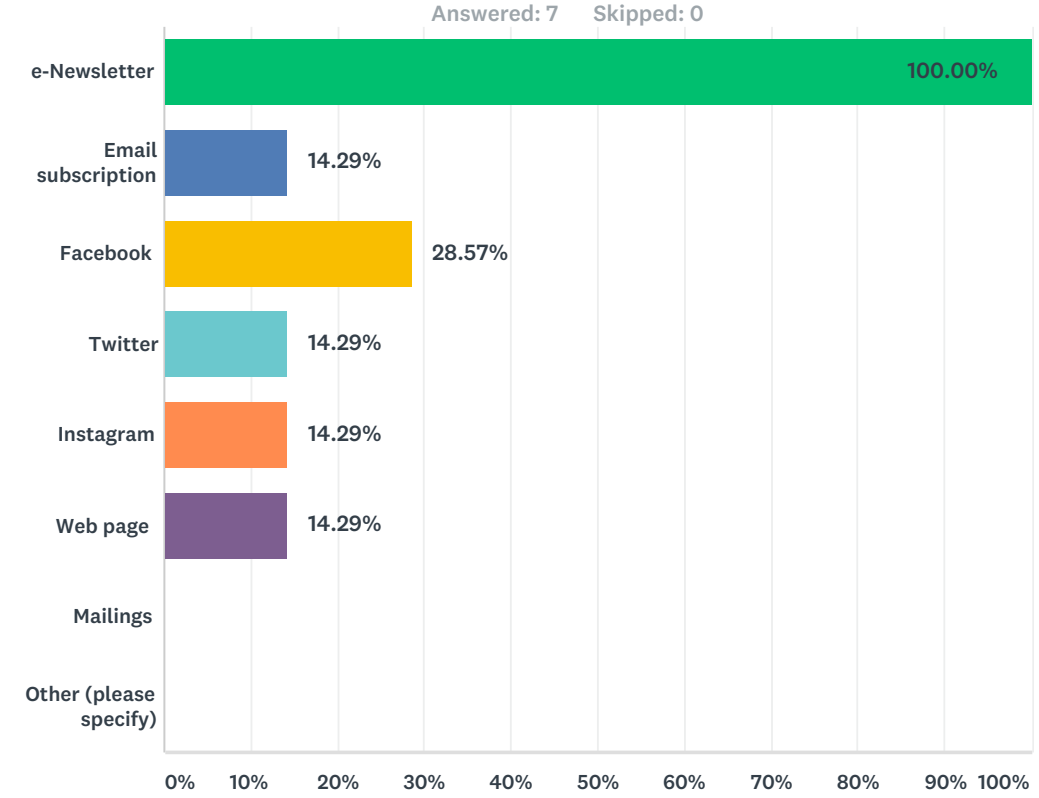
Q12 If no, what aspects contribute to this preference?

Answered: 2 Skipped: 5



Q13 Which of the following platforms would you use for regular updates and information about the airport?

Answered: 7 Skipped: 0

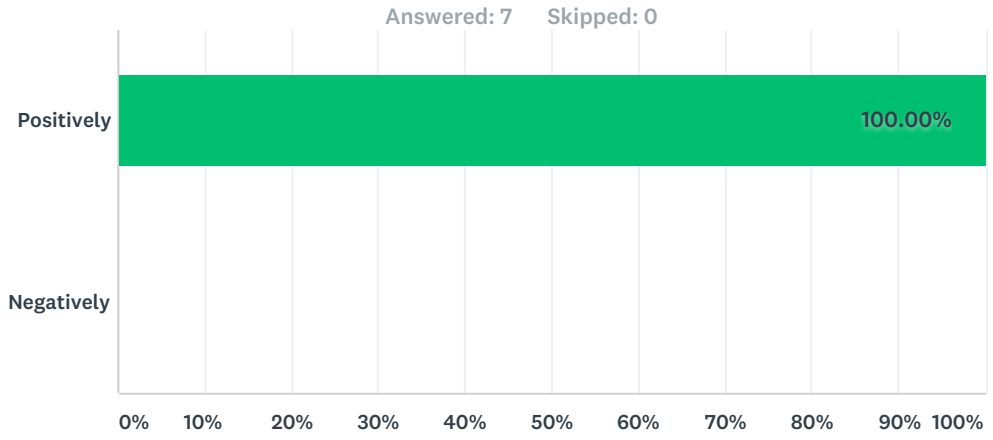


Q1 How would you describe the airport's benefit to the community?

Answered: 7 Skipped: 0

#	Responses	Date
1	Fairly close proximity for business and personal travel	5/12/2017 11:12 AM
2	Convenient air service to support business and leisure travelers	5/11/2017 2:10 PM
3	A crucial asset for quality of life, economic development, and an economic driver for the community.	5/9/2017 4:34 PM
4	a silent economic development asset	4/29/2017 7:47 AM
5	GSP Airport is one of our most beneficial assets and improves economic development and quality of life ion numerous ways.	4/28/2017 12:34 PM
6	Conveinience	4/25/2017 11:09 AM
7	Convenient	4/25/2017 8:37 AM

Q2 How do you feel the airport impacts the community overall?



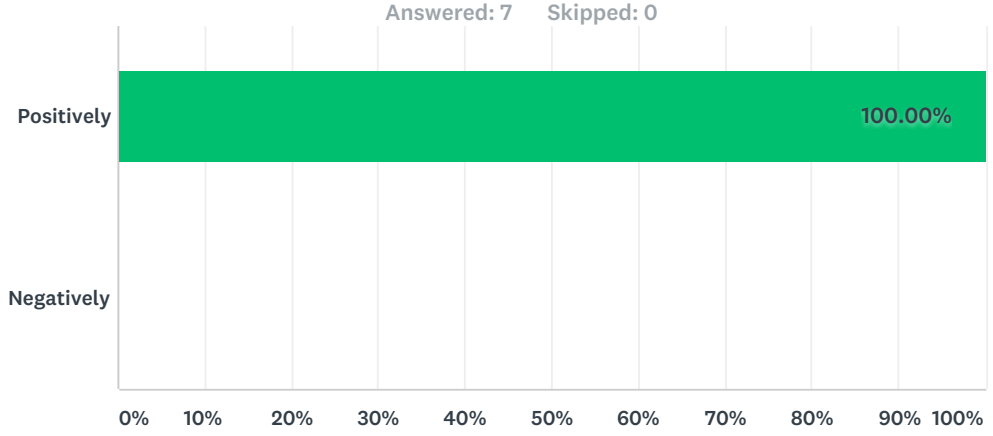
Q3 Please explain

Answered: 6 Skipped: 1

#	Responses	Date
1	It is beneficial to have an airport to attract business. It is great to not have to drive to Charlotte or Atlanta to fly.	5/12/2017 11:14 AM
2	Having an airport is a competitive advantage. It gives the Upstate credibility. Having an airport is often a minimum requirement for companies or people considering relocation, expansion, or startup. For many, the airport is the first impression of the Upstate.	5/11/2017 2:13 PM
3	Ease of travel for pleasure or business coupled with job creation benefits the community and our residents	5/9/2017 4:34 PM
4	Keeps business moving	4/29/2017 7:48 AM
5	Having an international, world class airport which connects your community to the world helps our area grow and prosper.	4/28/2017 12:34 PM
6	Excellent front door to the upstate.	4/25/2017 8:37 AM

Q4 How do you feel the airport impacts local businesses?

Answered: 7 Skipped: 0



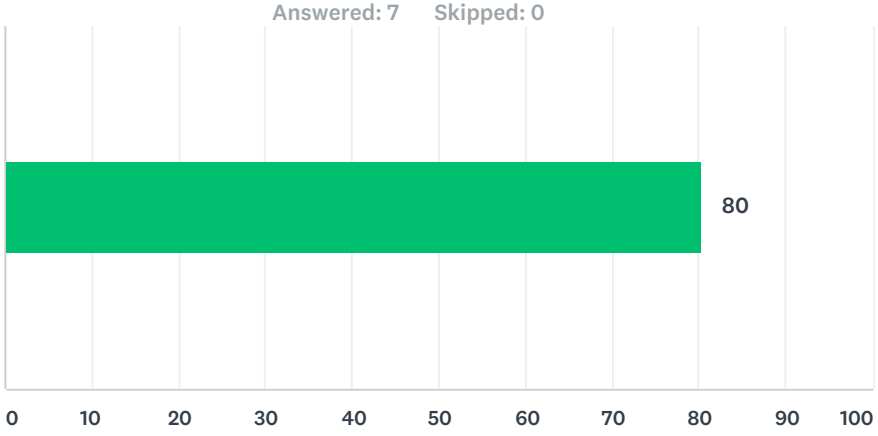
Q5 Please explain

Answered: 6 Skipped: 1

#	Responses	Date
1	Having a airport helps can bring in tourists and potential customers	5/12/2017 11:16 AM
2	The opportunity for air service is critical. The practicality and convenience of GSP is a significant selling point.	5/11/2017 2:15 PM
3	Provides ease of travel for business trips as well as brings validity to the area. The growth potential of the area is increased due to the location of the airport	5/9/2017 4:35 PM
4	Provides a option for travel that is close, convenient and priced right.	4/29/2017 7:48 AM
5	It allows for business people to travel to and from Greenville in an easy, convenient way, which enhances our business opportunities at home and abroad.	4/28/2017 12:36 PM
6	provides convenient access for air travel.	4/25/2017 8:38 AM

Q6 How do you feel the airport represents the community?

Answered: 7 Skipped: 0



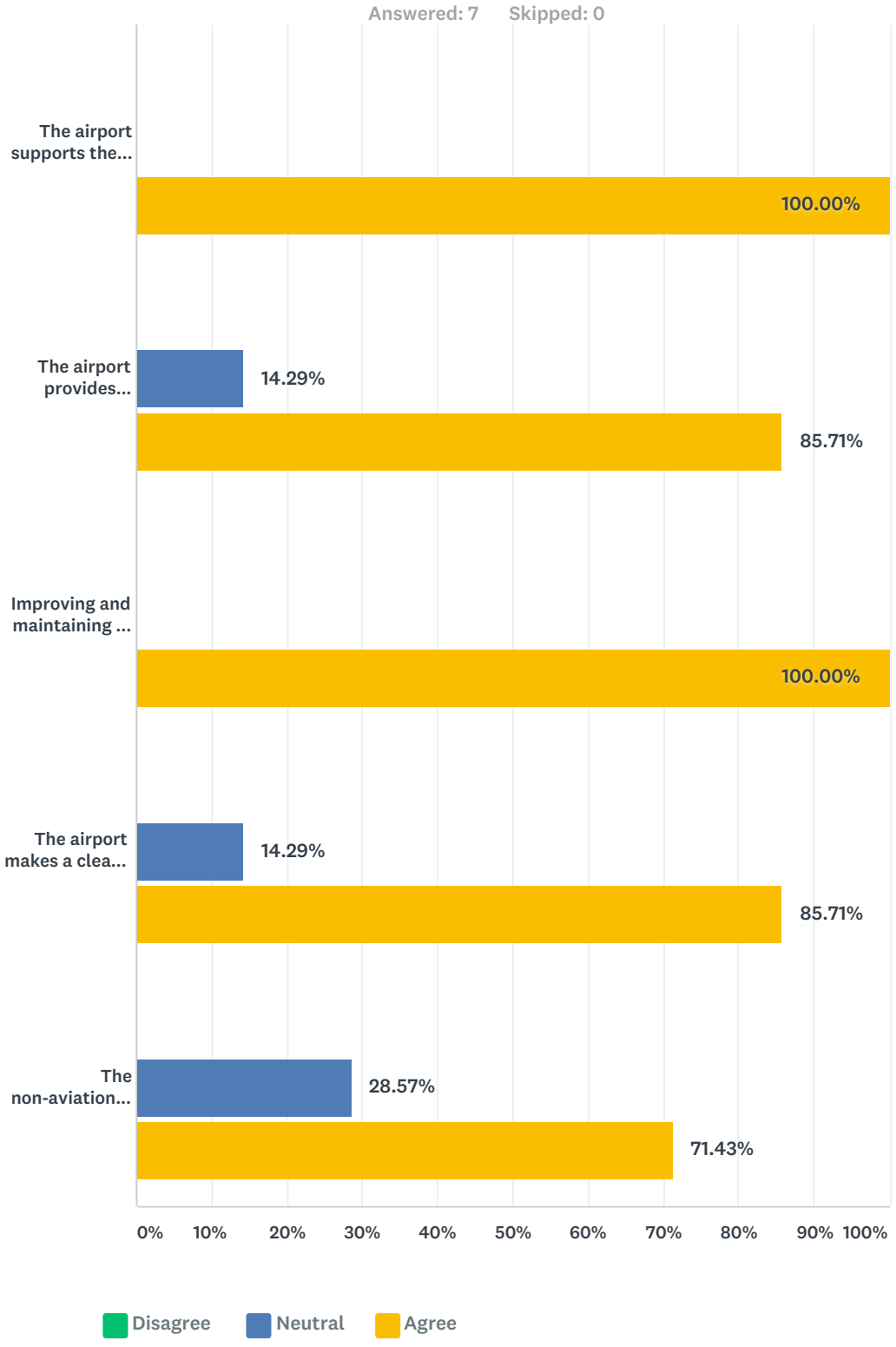
#		Date
1	97	5/12/2017 11:19 AM
2	97	5/11/2017 2:15 PM
3	90	5/9/2017 4:35 PM
4	51	4/29/2017 7:49 AM
5	100	4/28/2017 12:36 PM
6	50	4/25/2017 11:09 AM
7	77	4/25/2017 8:38 AM

Q7 Please explain.

Answered: 5 Skipped: 2

#	Responses	Date
1	It is attractive and gives a good first impression to someone flying in to the Upstate.	5/12/2017 11:19 AM
2	Professional operation. State of the art appearance. Great reputation.	5/11/2017 2:15 PM
3	Very active in community involvement among the residents and businesses. The quality of our airport facilities are well above other airports this size or bigger.	5/9/2017 4:35 PM
4	I think the airport does the best it can given its location and budgets.	4/29/2017 7:49 AM
5	Exceeds by being convenient, updated, efficient, and connects to many locations.	4/28/2017 12:36 PM

Q8 Please indicate the level to which you agree with each of the following statements.

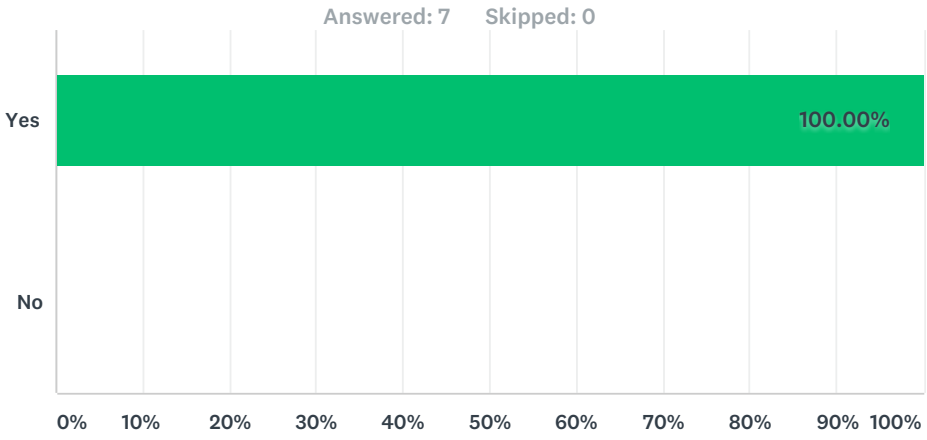


Q9 Please explain items that can be improved.

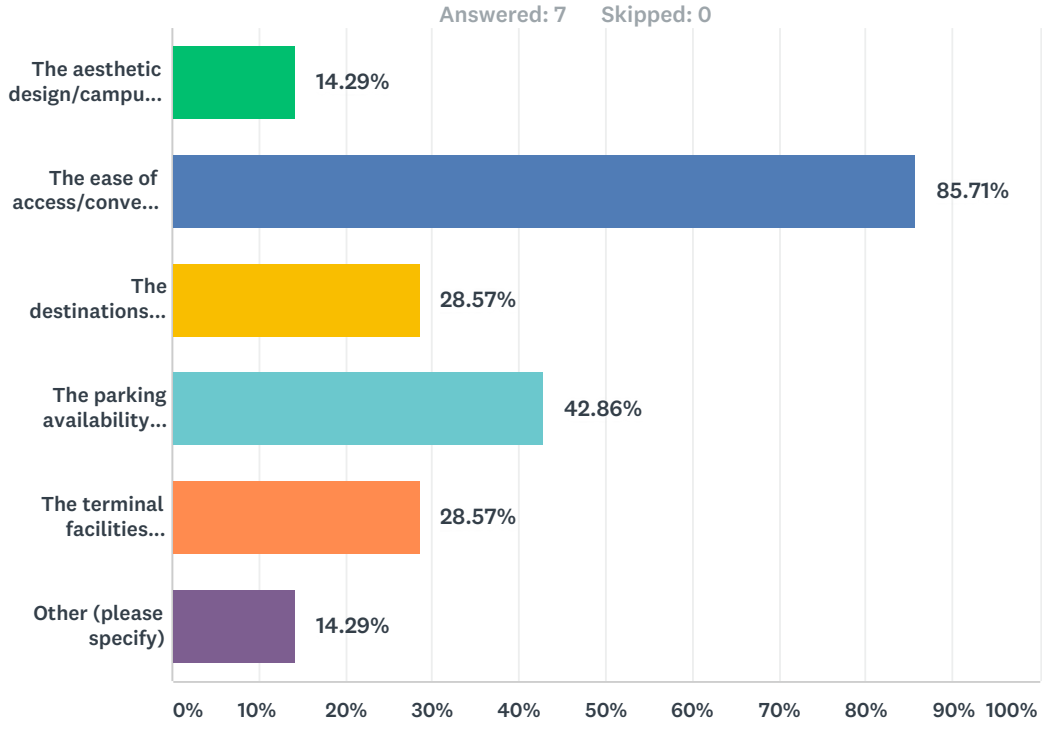
Answered: 3 Skipped: 4

#	Responses	Date
1	There is a significant challenge with respect to expectations of business and leisure travelers. GSP absolutely provides appropriate levels of service to destinations relevant to the community, but the inevitability of comparisons to airports in much larger communities such as Charlotte invite unreasonable expectations.	5/11/2017 2:21 PM
2	Of course would like to continue to see more destination options but the options we do have are great.	5/9/2017 4:37 PM
3	Reaching out beyond GSP to share the message. Get in front of the other communities in the Upstate region, I-77 region to talk about the benefits of the airport.	4/29/2017 7:50 AM

Q10 Do you prefer using GSP over other airports in the region?

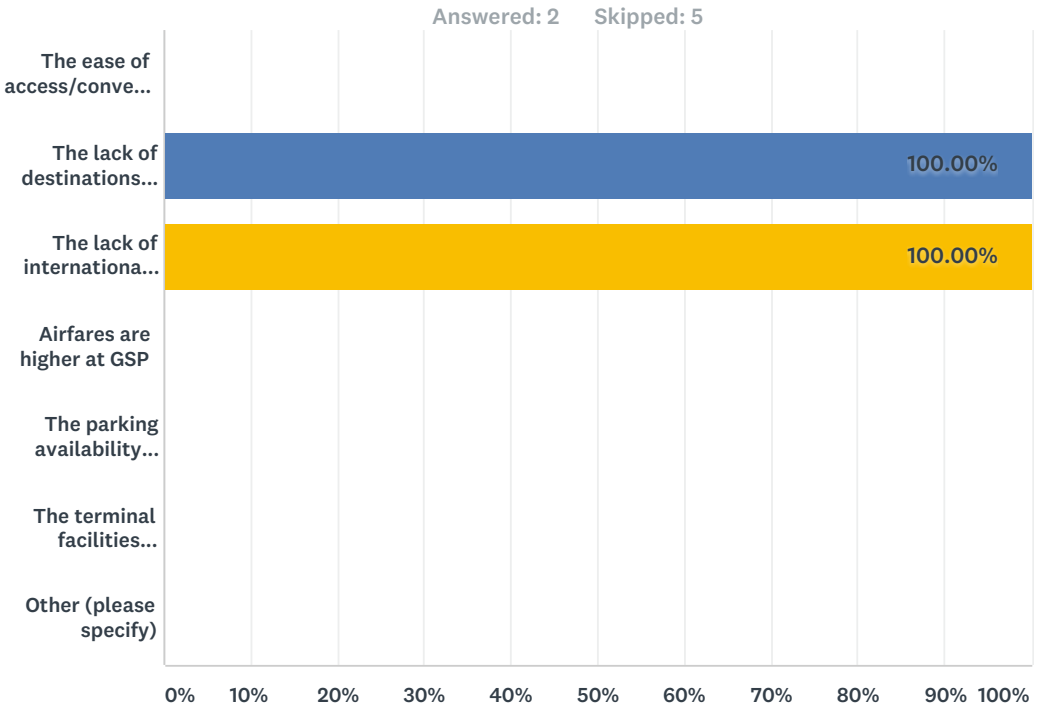


Q11 If yes, what aspects contribute to this preference?



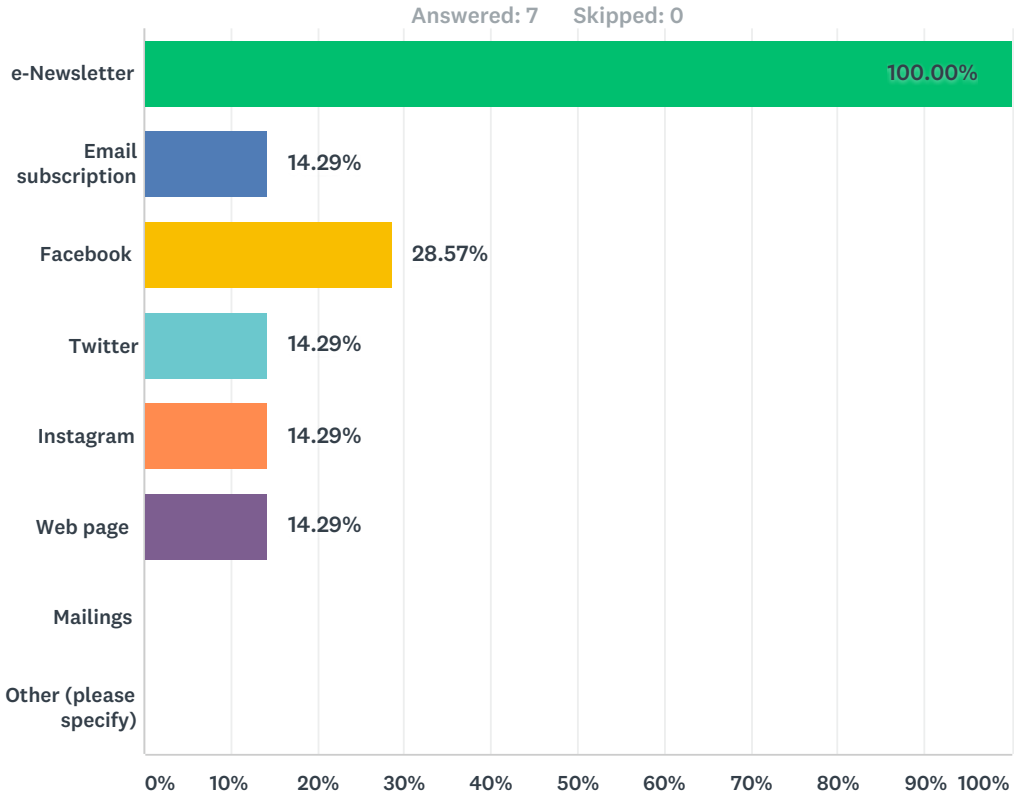
#	Other (please specify)	Date
1	It is closer	5/12/2017 11:20 AM

Q12 If no, what aspects contribute to this preference?



#	Other (please specify)	Date
	There are no responses.	

Q13 Which of the following platforms would you use for regular updates and information about the airport?



#	Other (please specify)	Date
	There are no responses.	

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, April 25, 2017 8:36:05 AM
Last Modified:	Tuesday, April 25, 2017 8:39:36 AM
Time Spent:	00:03:30
IP Address:	24.241.146.242

Page 2

Q1

How would you describe the airport's benefit to the community?

Convenient

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

Excellent front door to the upstate.

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

provides convenient access for air travel.

Page 5

Q6

How do you feel the airport represents the community?

77

Q7

Please explain.

Respondent skipped this question

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Agree
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Agree
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Neutral

Q9

Please explain items that can be improved.

Respondent skipped this question

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The aesthetic design/campus landscape,

The ease of access/convenience,

The destinations being serviced out of the airport,

The parking availability/price,

The terminal facilities (Check-in, concessions, security lines, etc.)

Q12

If no, what aspects contribute to this preference?

Respondent skipped this question

Page 8

Q13

Which of the following platforms would you use for regular updates and information about the airport?

e-Newsletter

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, April 25, 2017 11:08:08 AM
Last Modified:	Tuesday, April 25, 2017 11:09:48 AM
Time Spent:	00:01:40
IP Address:	209.213.22.146

Page 2

Q1

How would you describe the airport's benefit to the community?

Conveinience

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

Respondent skipped this question

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

Respondent skipped this question

Page 5

Q6

How do you feel the airport represents the community?

50

Q7

Please explain.

Respondent skipped this question

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Neutral
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Neutral
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Neutral

Q9

Please explain items that can be improved.

Respondent skipped this question

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The ease of access/convenience

Q12

If no, what aspects contribute to this preference?

Respondent skipped this question

Page 8

Q13

Which of the following platforms would you use for regular updates and information about the airport?

e-Newsletter

COMPLETE

Collector:	**Web Link 1** (Web Link)
Started:	**Friday, April 28, 2017 12:32:21 PM**
Last Modified:	**Friday, April 28, 2017 12:37:25 PM**
Time Spent:	**00:05:03**
IP Address:	**76.219.89.1**

Page 2

Q1

How would you describe the airport's benefit to the community?

GSP Airport is one of our most beneficial assets and improves economic development and quality of life ion numerous ways.

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

Having an international, world class airport which connects your community to the world helps our area grow and prosper.

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

It allows for business people to travel to and from Greenville in an easy, convenient way, which enhances our business opportunities at home and abroad.

Page 5

Q6

How do you feel the airport represents the community?

100

Q7

Please explain.

Exceeds by being convenient, updated, efficient, and connects to many locations.

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Agree
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Agree
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Agree

Q9

Please explain items that can be improved.

Respondent skipped this question

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The ease of access/convenience,

The destinations being serviced out of the airport,

The parking availability/price,

The terminal facilities (Check-in, concessions, security lines, etc.)

Q12

If no, what aspects contribute to this preference?

Respondent skipped this question

Page 8

Q13

Which of the following platforms would you use for regular updates and information about the airport?

e-Newsletter

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Saturday, April 29, 2017 7:45:46 AM
Last Modified:	Saturday, April 29, 2017 7:50:53 AM
Time Spent:	00:05:07
IP Address:	108.91.96.214

Page 2

Q1

How would you describe the airport's benefit to the community?

a silent economic development asset

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

Keeps business moving

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

Provides a option for travel that is close, convenient and priced right.

Page 5

Q6

How do you feel the airport represents the community?

51

Q7

Please explain.

I think the airport does the best it can given its location and budgets.

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Agree
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Agree
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Agree

Q9

Please explain items that can be improved.

Reaching out beyond GSP to share the message. Get in front of the other communities in the Upstate region, I-77 region to talk about the benefits of the airport.

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The parking availability/price

Q12

If no, what aspects contribute to this preference?

The lack of destinations/direct flights out of the airport, The lack of international flights

Page 8

Q13

Which of the following platforms would you use for regular updates and information about the airport?

e-Newsletter

COMPLETE

Collector:	**Web Link 1** (Web Link)
Started:	**Tuesday, May 09, 2017 4:32:28 PM**
Last Modified:	**Tuesday, May 09, 2017 4:38:20 PM**
Time Spent:	**00:05:52**
IP Address:	**68.115.124.117**

Page 2

Q1

How would you describe the airport's benefit to the community?

A crucial asset for quality of life, economic development, and an economic driver for the community.

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

Ease of travel for pleasure or business coupled with job creation benefits the community and our residents

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

Provides ease of travel for business trips as well as brings validity to the area. The growth potential of the area is increased due to the location of the airport

Page 5

Q6

How do you feel the airport represents the community?

90

Q7

Please explain.

Very active in community involvement among the residents and businesses. The quality of our airport facilities are well above other airports this size or bigger.

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Agree
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Agree
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Agree

Q9

Please explain items that can be improved.

Of course would like to continue to see more destination options but the options we do have are great.

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The ease of access/convenience

Q12

If no, what aspects contribute to this preference?

Respondent skipped this question

Page 8

Q13	
Which of the following platforms would you use for regular updates and information about the airport?	**e-Newsletter,Email subscription,Facebook,Instagram,** **Web page**

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, April 25, 2017 2:11:59 PM
Last Modified:	Thursday, May 11, 2017 2:22:50 PM
Time Spent:	Over a week
IP Address:	68.115.235.34

Page 2

Q1

How would you describe the airport's benefit to the community?

Convenient air service to support business and leisure travelers

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

Having an airport is a competitive advantage. It gives the Upstate credibility. Having an airport is often a minimum requirement for companies or people considering relocation, expansion, or startup. For many, the airport is the first impression of the Upstate.

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

The opportunity for air service is critical. The practicality and convenience of GSP is a significant selling point.

Page 5

Q6

How do you feel the airport represents the community?

97

Q7

Please explain.

Professional operation. State of the art appearance. Great reputation.

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Agree
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Agree
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Agree

Q9

Please explain items that can be improved.

There is a significant challenge with respect to expectations of business and leisure travelers. GSP absolutely provides appropriate levels of service to destinations relevant to the community, but the inevitability of comparisons to airports in much larger communities such as Charlotte invite unreasonable expectations.

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The ease of access/convenience

Q12 **If no, what aspects contribute to this preference?**	**The lack of destinations/direct flights out of the airport ,** **The lack of international flights**

Page 8

Q13 **Which of the following platforms would you use for regular updates and information about the airport?**	**e-Newsletter,Twitter**

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Friday, May 12, 2017 11:10:39 AM
Last Modified:	Friday, May 12, 2017 11:20:17 AM
Time Spent:	00:09:38
IP Address:	206.74.128.194

Page 2

Q1

How would you describe the airport's benefit to the community?

Fairly close proximity for business and personal travel

Page 3

Q2

How do you feel the airport impacts the community overall?

Positively

Q3

Please explain

It is beneficial to have an airport to attract business. It is great to not have to drive to Charlotte or Atlanta to fly.

Page 4

Q4

How do you feel the airport impacts local businesses?

Positively

Q5

Please explain

Having a airport helps can bring in tourists and potential customers

Page 5

Q6

How do you feel the airport represents the community?

97

Q7

Please explain.

It is attractive and gives a good first impression to someone flying in to the Upstate.

Page 6

Q8

Please indicate the level to which you agree with each of the following statements.

The airport supports the growth of the local economy.	Agree
The airport provides appropriate levels of service to destinations relevant to the community.	Agree
Improving and maintaining GSP is vital to the local economy.	Agree
The airport makes a clear effort to communicate to its community stakeholder groups.	Agree
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	Agree

Q9

Please explain items that can be improved.

Respondent skipped this question

Page 7

Q10

Do you prefer using GSP over other airports in the region?

Yes

Q11

If yes, what aspects contribute to this preference?

The ease of access/convenience,
Other (please specify) It is closer

Q12

If no, what aspects contribute to this preference?

Respondent skipped this question

Page 8

Q13

Which of the following platforms would you use for regular updates and information about the airport?

e-Newsletter,Facebook

Greenville-Spartanburg International Airport Community Stakeholder Group Survey

Welcome to the GSP Community Stakeholder Group Survey

The Greenville-Spartanburg Airport District has embarked upon an important and comprehensive project to update the Airport Master Plan for the Greenville-Spartanburg International Airport (GSP). The Master Plan focuses on providing a safe, convenient, user-friendly and cost competitive air transportation system for all airport users. To ensure maximum community input, we have asked for your assistance by completing this survey on the current airport environment.

Greenville-Spartanburg International Airport Community Stakeholder Group Survey

1. How would you describe the airport's benefit to the community?

Greenville-Spartanburg International Airport Community Stakeholder Group Survey

2. How do you feel the airport impacts the community overall?

- ◯ Positively
- ◯ Negative

3. Please explain

Greenville-Spartanburg International Airport
Community Stakeholder Group Survey

4. How do you feel the airport impacts local businesses?

- ◯ Positively
- ◯ Negatively

5. Please explain

Greenville-Spartanburg International Airport
Community Stakeholder Group Survey

6. How do you feel the airport represents the community?

Below expectations | Meets Expectations | Exceeds Expectations

7. Please explain.

Greenville-Spartanburg International Airport
Community Stakeholder Group Survey

8. Please indicate the level to which you agree with each of the following statements.

	Disagree	Neutral	Agree
The airport supports the growth of the local economy.	○	○	○
The airport provides appropriate levels of service to destinations relevant to the community.	○	○	○
Improving and maintaining GSP is vital to the local economy.	○	○	○
The airport makes a clear effort to communicate to its community stakeholder groups.	○	○	○
The non-aviation services at the airport are sufficient (parking, restaurants, shops, etc.).	○	○	○

9. Please explain items that can be improved.

10. Do you prefer using GSP over other airports in the region?

- ○ Yes
- ○ No

11. If yes, what aspects contribute to this preference?

- ☐ The aesthetic design/campus landscape
- ☐ The ease of access/convenience
- ☐ The destinations being serviced out of the airport
- ☐ The parking availability/price
- ☐ The terminal facilities (Check-in, concessions, security lines, etc.)
- ☐ Other (please specify)

12. If no, what aspects contribute to this preference?

- ☐ The ease of access/convenience
- ☐ The lack of destinations/direct flights out of the airport
- ☐ The lack of international flights
- ☐ Airfares are higher at GSP
- ☐ The parking availability/price
- ☐ The terminal facilities (Check-in, concessions, security lines, etc.)
- ☐ Other (please specify)

13. Which of the following platforms would you use for regular updates and information about the airport?

- [ ] e-Newsletter
- [ ] Email subscription
- [ ] Facebook
- [ ] Twitter
- [ ] Instagram
- [ ] Web page
- [ ] Mailings
- [ ] Other (please specify)

Greenville-Spartanburg International Airport
Community Stakeholder Group Survey

Thank you for participating!

More information on the ongoing efforts at GSP and the opportunity for questions or concerns can be found at the following website http://elevatingtheupstate.com/.

Greenville-Spartanburg International Airport Tenant Survey

Welcome to the GSP Tenant Survey

The Greenville-Spartanburg Airport District has embarked upon an important and comprehensive project to update the Airport Master Plan for the Greenville-Spartanburg International Airport (GSP). The Master Plan focuses on providing a safe, convenient, user-friendly and cost competitive air transportation system for all airport users. To ensure maximum tenant input, we have asked for your assistance by completing this survey on the current airport environment.

Greenville-Spartanburg International Airport Tenant Survey

1. How long has your company been a tenant at the airport (in years)?

2. How long have you worked at GSP (in years)?

Greenville-Spartanburg International Airport Tenant Survey

3. How would you rate the space your organization currently occupies?

Below Expectations | Meets Expectations | Exceeds Expectations

4. If below expectations, please explain.

Greenville-Spartanburg International Airport Tenant Survey

5. Is the size of your tenant space appropriate for your company's business?

- Yes
- No

If no, please explain

6. Is the location of your tenant space appropriate for your company's business?

- Yes
- No

If no, please explain

7. Is the quality of your tenant space appropriate for your company's business?

- Yes
- No

If no, please explain

8. How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

Below Expectations | Meets Expectations | Exceeds Expectations

9. If below expectations, please explain.

10. How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

Below Expectations | Meets Expectations | Exceeds Expectations

11. If below expectations, please explain

Greenville-Spartanburg International Airport Tenant Survey

12. List three words that describe each of the following at GSP.

Strengths
(Airport conditions that support success)

Weaknesses
(Airport conditions that work against success)

Opportunities
(Market factors that can be capitalized)

Threats
(Market factors that can jeopardize airport success)

13. How does your business use the airport?

- ○ General Aviation
- ○ Air Passenger Carrier
- ○ Air Cargo/Freight Carrier
- ○ TSA/ U.S. Customs & Border Proctection
- ○ Concessionaire (restaurant/shop)
- ○ Rental Car
- ○ Parking Operator/Ground Transportation
- ○ Transportation Network Company (Taxi/Ride sharing service)

Greenville-Spartanburg International Airport Tenant Survey

14. Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

15. What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

Greenville-Spartanburg International Airport Tenant Survey

16. Please indicate your level of satisfaction with each of the following

	Below Expectations	Meets Expectations	Exceeds Expectations	This is not applicable to me
Airfield	○	○	○	○
Terminal facilities	○	○	○	○
Groundskeeping	○	○	○	○
Security	○	○	○	○
Baggage Handling Procedures/Facilities	○	○	○	○
Ground Service Equipment Utilization	○	○	○	○
Navigational Aid (NAVAID)	○	○	○	○

17. Is there any additional ground service equipment you would like to see available at GSP?

- ○ No additions necessary
- ○ This does not apply to me
- ○ Additional GSE could include:

Greenville-Spartanburg International Airport Tenant Survey

18. How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)

Below Expectations | Meets Expectations | Exceeds Expectations

19. How can this be improved?

20. Please indicate whether the appropriate amount of each of the following are available at GSP:

	Below Expectations	Meets Expectations	Exceeds Expectations	This does not apply to me
Hangars	○	○	○	○
Tie downs	○	○	○	○
Gates	○	○	○	○
Cargo Aprons and Hangars	○	○	○	○

Greenville-Spartanburg International Airport Tenant Survey

21. Does your company/organization participate in any recycling programs?

- ○ Yes
- ○ No

If yes, please describe the program

Greenville-Spartanburg International Airport Tenant Survey

22. Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

- ◯ Yes
- ◯ No

If no, please explain

Greenville-Spartanburg International Airport Tenant Survey

23. How does the amount of traffic congestion when entering the airport compare to nearby airports?

- ◯ Traffic at GSP is similar compared to nearby airports
- ◯ Traffic at GSP is high compared to nearby airports
- ◯ Traffic at GSP is low compared to nearby airports
- ◯ I'm unsure/ This does not apply to me

Please explain:

2040
WINGSPAN
A VISION FOR THE FUTURE

Greenville-Spartanburg International Airport Tenant Survey

24. Is the current parking availability adequate for the needs of your employees and customers?

- ◯ Yes
- ◯ No
- ◯ If no, please explain. (Location, space available, etc.)

Greenville-Spartanburg International Airport Tenant Survey

Survey
End

Thank you for participating!

More information on the ongoing efforts at GSP and the opportunity for questions or concerns can be found on the following website http://elevatingtheupstate.com/ .

Greenville-Spartanburg International Airport User Survey

Welcome to the GSP Airport User Survey

The Greenville-Spartanburg Airport District has embarked upon an important and comprehensive project to update the Airport Master Plan for the Greenville-Spartanburg International Airport (GSP). The Master Plan focuses on providing a safe, convenient, user-friendly and cost competitive air transportation system for all airport users. To ensure maximum community input, we have asked for your assistance by completing this survey on the current airport environment.

Greenville-Spartanburg International Airport User Survey

* 1. In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Greenville-Spartanburg International Airport User Survey

* 2. In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

- ○ None
- ○ 1-3
- ○ 4-6
- ○ 7-10
- ○ More than 10

Greenville-Spartanburg International Airport User Survey

* 3. In the last 12 months, how many trips did you make using GSP for business purposes?

- None
- 1-3
- 4-6
- 7-10
- More than 10

Greenville-Spartanburg International Airport User Survey

* 4. How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

- None
- 1-3
- 4-6
- 7-10
- More than 10

Greenville-Spartanburg International Airport User Survey

* 5. How would you characterize your knowledge/awareness of the airport?

- I didn't know the community had an airport.
- I knew the community had an airport, but I'm not familiar with it (size, location, etc.).
- Somewhat familiar
- Very familiar

Greenville-Spartanburg International Airport User Survey

* 6. How do you primarily get to/from the airport?

- Private vehicle, parking
- Private vehicle, drop-off
- Taxi/Limo
- Rideshare provider (Uber/Lyft)
- Shuttle
- Rental Car
- Public Transit
- Walk/Bike
- Other (please specify)

Greenville-Spartanburg International Airport User Survey

* 7. How would you rank each of the following at GSP?

	Below Expectation	Meets Expectation	Exceeds Expectation	Does not apply/Unfamiliar
Airport Access/Directional Signage	◯	◯	◯	◯
Parking	◯	◯	◯	◯
Rental Car Facilities	◯	◯	◯	◯
Ticketing/Check-In	◯	◯	◯	◯
Directional signage inside the terminal	◯	◯	◯	◯
Security screening process	◯	◯	◯	◯
Restrooms	◯	◯	◯	◯
Size/Comfort of hold rooms	◯	◯	◯	◯
Concessions (restaurants/shops)	◯	◯	◯	◯
Baggage Claim	◯	◯	◯	◯
Customs facilities	◯	◯	◯	◯

If below expectations, please explain.

* 8. Please indicate how satisfied you are with each aspect of the parking layout at GSP.

	Below Expectation	Meets Expectation	Exceeds Expectation	Does not apply/Unfamiliar
Location/proximity to terminal	○	○	○	○
Amount of garage parking availability	○	○	○	○
Amount of economy parking availability	○	○	○	○
Ease of exit from lot and parking options	○	○	○	○
Availability of valet parking	○	○	○	○

If below expectations, please explain.

Greenville-Spartanburg International Airport User Survey

* 9. Where do you usually check in for your flight?

- ○ Ticket counter
- ○ E-ticket kiosk
- ○ Mobile device
- ○ On-line (home computer)
- ○ Other (please specify)

Greenville-Spartanburg International Airport User Survey

10. Please indicate your overall impression of the airport.

11. What three words would you use to describe GSP?

Greenville-Spartanburg International Airport User Survey

Survey
End

Thank you for participating!

More information on the ongoing efforts at GSP and the opportunity for questions or concerns can be found at http://elevatingtheupstate.com/contact/ .

Q1 How long has your company been a tenant at the airport (in years)?

Answered: 5 Skipped: 0

#	Responses	Date
1	15	5/16/2017 9:00 AM
2	30	5/15/2017 8:30 AM
3	25	5/11/2017 4:33 PM
4	7	5/11/2017 3:14 PM
5	35	5/10/2017 4:38 PM

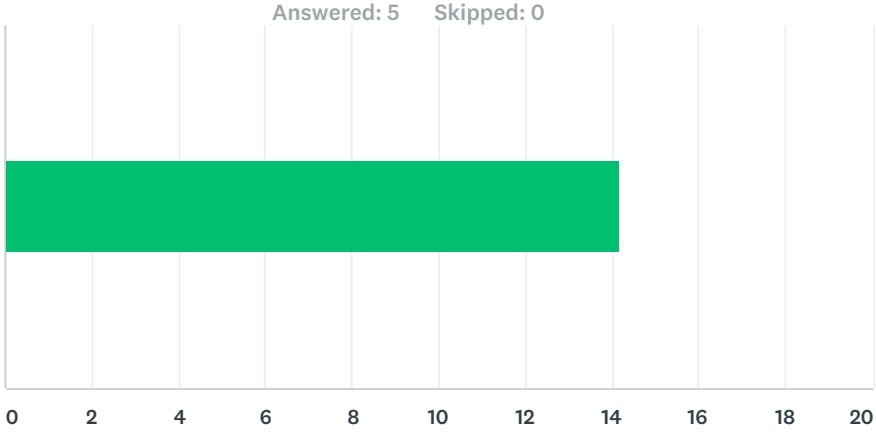
Q2 How long have you worked at GSP (in years)?

Answered: 4 Skipped: 1

#	Responses	Date
1	1	5/16/2017 9:00 AM
2	17	5/11/2017 4:33 PM
3	4	5/11/2017 3:14 PM
4	12	5/10/2017 4:38 PM

Q3 How would you rate the space your organization currently occupies?

Answered: 5 Skipped: 0



Answer Choices	Average Number	Total Number	Responses
	14	71	5
Total Respondents: 5			

#		Date
1	0	5/16/2017 9:01 AM
2	35	5/15/2017 8:31 AM
3	27	5/11/2017 4:34 PM
4	7	5/11/2017 3:15 PM
5	2	5/10/2017 4:39 PM

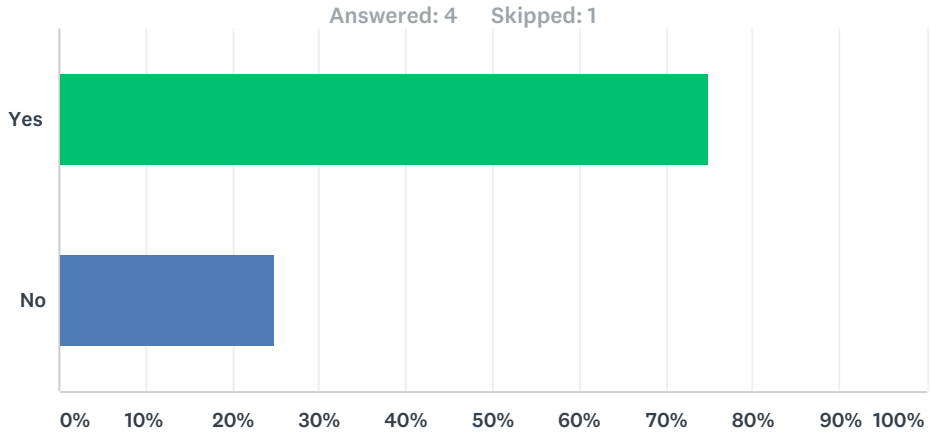
Q4 If below expectations, please explain.

Answered: 5 Skipped: 0

#	Responses	Date
1	We are expecting to move into the new TSA space in the next few months. The existing space needs updating.	5/16/2017 9:01 AM
2	facilities are old and need to be refurbished	5/15/2017 8:31 AM
3	We would like to renovate but plans are continuly pushed aside.	5/11/2017 4:34 PM
4	concourse space is too small	5/11/2017 3:15 PM
5	Ramp offices have damage cause by faulty airport HVAC sytem and was never repaired. The area hasn't been refreshed since we moved in over 30 years ago.	5/10/2017 4:39 PM

Q5 Is the size of your tenant space appropriate for your company's business?

Answered: 4 Skipped: 1

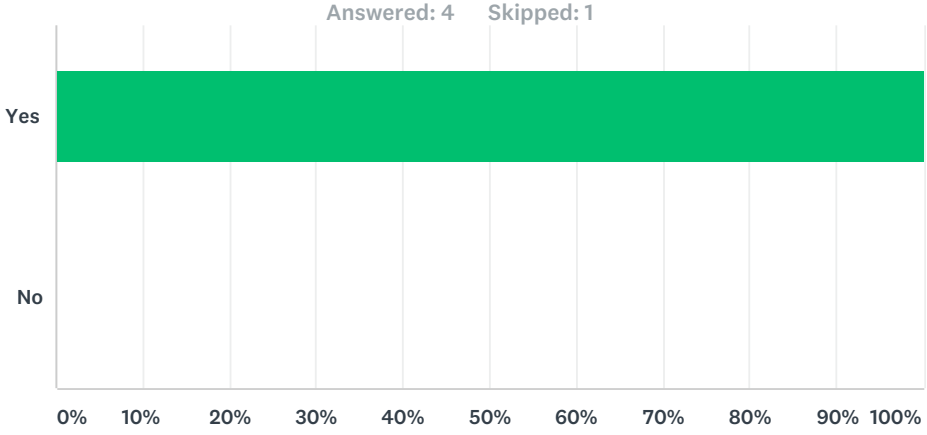


Answer Choices	Responses	
Yes	75.00%	3
No	25.00%	1
TOTAL		4

#	If no, please explain	Date
1	not big enough	5/11/2017 3:15 PM

Q6 Is the location of your tenant space appropriate for your company's business?

Answered: 4 Skipped: 1

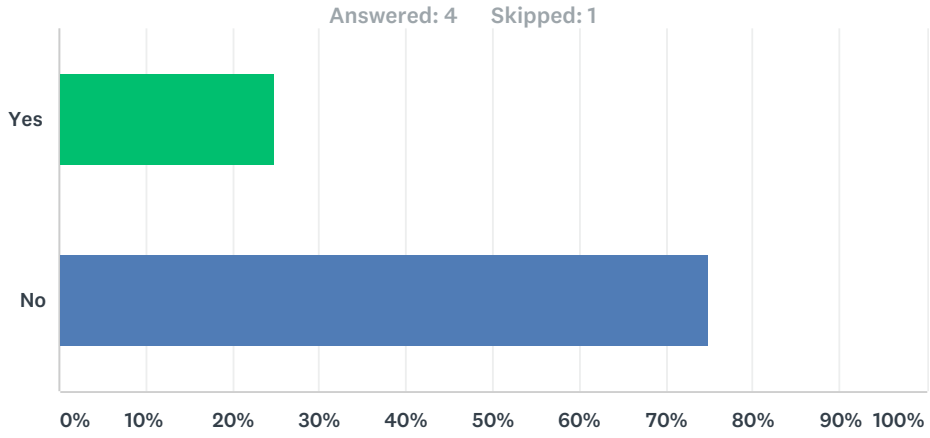


Answer Choices	Responses	
Yes	100.00%	4
No	0.00%	0
TOTAL		4

#	If no, please explain	Date
	There are no responses.	

Q7 Is the quality of your tenant space appropriate for your company's business?

Answered: 4 Skipped: 1

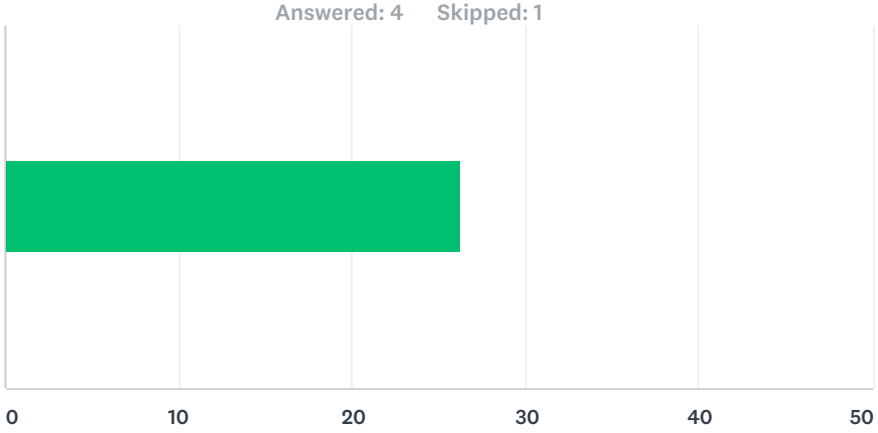


Answer Choices	Responses	
Yes	25.00%	1
No	75.00%	3
TOTAL		4

#	If no, please explain	Date
1	the office is not clean and services are poor	5/15/2017 8:32 AM
2	Still looking to upgrade and renovate	5/11/2017 4:34 PM
3	Ramp Offices outdated, damaged drywall, sagging ceiling tiles, need to be completely gutted due to never refreshed by airport.	5/10/2017 4:42 PM

Q8 How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

Answered: 4 Skipped: 1



Answer Choices	Average Number	Total Number	Responses
	26	105	4
Total Respondents: 4			

#		Date
1	21	5/15/2017 8:33 AM
2	75	5/11/2017 4:36 PM
3	6	5/11/2017 3:16 PM
4	3	5/10/2017 4:48 PM

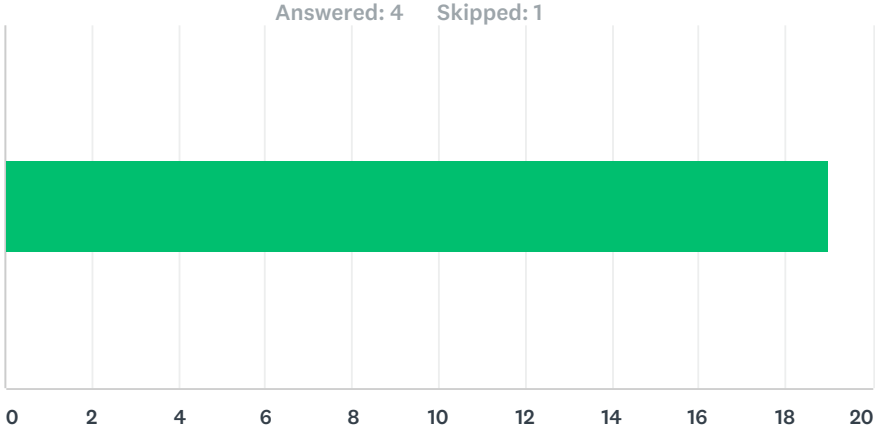
Q9 If below expectations, please explain.

Answered: 3 Skipped: 2

#	Responses	Date
1	We have to call them	5/15/2017 8:33 AM
2	roof leaks	5/11/2017 3:16 PM
3	The VP of airport facilities responds at his convenience.	5/10/2017 4:48 PM

Q10 How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

Answered: 4 Skipped: 1



Answer Choices	Average Number	Total Number	Responses
	19	76	4
Total Respondents: 4			

#		Date
1	2	5/15/2017 8:33 AM
2	65	5/11/2017 4:36 PM
3	6	5/11/2017 3:16 PM
4	3	5/10/2017 4:48 PM

Q11 If below expectations, please explain

Answered: 3 Skipped: 2

#	Responses	Date
1	Issues are not addressed in a timely mannor	5/15/2017 8:33 AM
2	never hear about diversions or charters	5/11/2017 3:16 PM
3	VP of Facilities only follows up on issues he feels are relevant. When pressed his response was "if Delta doesn't like it they can always leave".	5/10/2017 4:48 PM

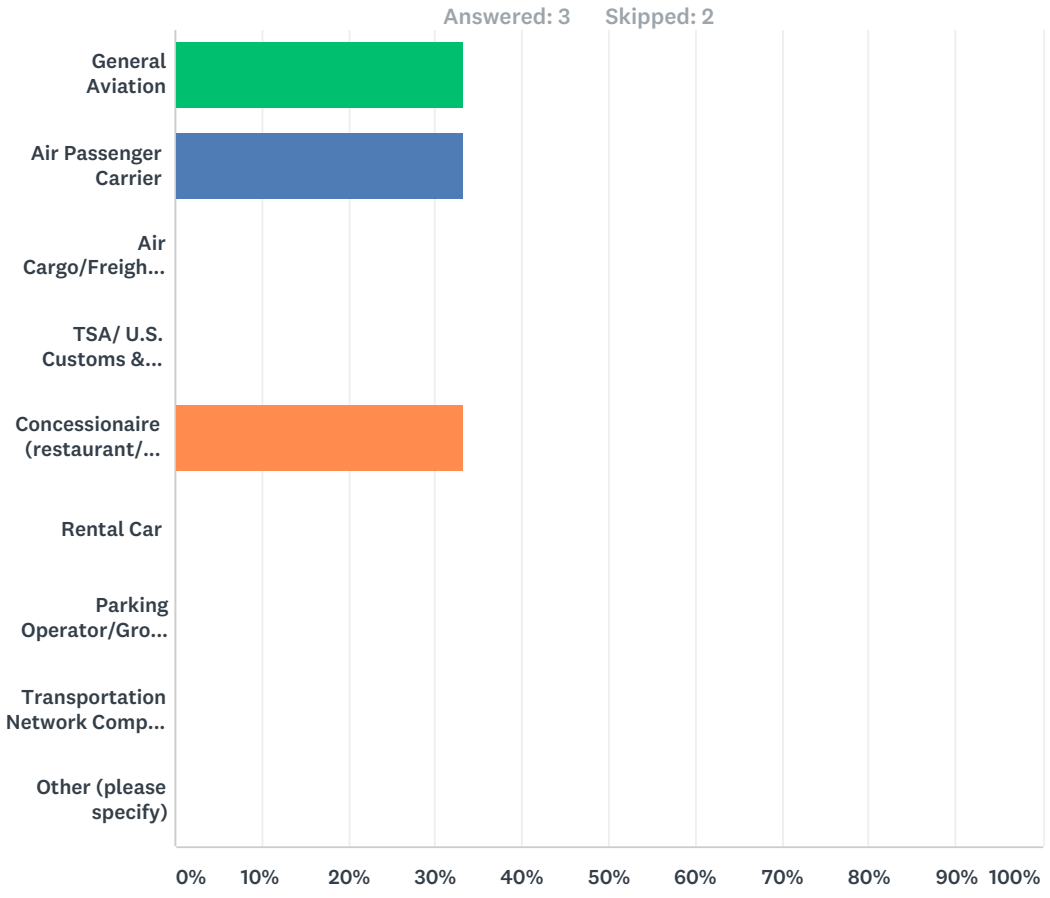
Q12 List three words that describe each of the following at GSP.

Answered: 3 Skipped: 2

Answer Choices	Responses	
Strengths(Airport conditions that support success)	100.00%	3
Weaknesses(Airport conditions that work against success)	100.00%	3
Opportunities(Market factors that can be capitalized)	100.00%	3
Threats(Market factors that can jeopardize airport success)	100.00%	3

#	Strengths(Airport conditions that support success)	Date
1	fuel price	5/15/2017 8:37 AM
2	clean	5/11/2017 3:17 PM
3	Administrative support staff, departmental managers and some executive staff are excellent. They try to make this a partnership and make us feel this is a true partnership even though some executives do not.	5/10/2017 5:05 PM
#	Weaknesses(Airport conditions that work against success)	Date
1	old facilities	5/15/2017 8:37 AM
2	space size and storage	5/11/2017 3:17 PM
3	Senior Airport Leadership doesn't understand the business of their tenant/customers. Give the impression they don't care.	5/10/2017 5:05 PM
#	Opportunities(Market factors that can be capitalized)	Date
1	long range contracts for fuel	5/15/2017 8:37 AM
2	low fare airlines	5/11/2017 3:17 PM
3	Remove the VP of Facilities and replace him with someone who is honest, trustworthy, who cares about airport tennants and values their business.	5/10/2017 5:05 PM
#	Threats(Market factors that can jeopardize airport success)	Date
1	unresponsive and uncooprative	5/15/2017 8:37 AM
2	charlotte/ more southwest flights	5/11/2017 3:17 PM
3	VP of Facilities telling the largest carrier at GSP if they don't like it here they can choose to leave. This person is despised by the majority of tennants at GSP and many GSP employees.	5/10/2017 5:05 PM

Q13 How does your business use the airport?



Answer Choices	Responses	
General Aviation	33.33%	1
Air Passenger Carrier	33.33%	1
Air Cargo/Freight Carrier	0.00%	0
TSA/ U.S. Customs & Border Proctection	0.00%	0
Concessionaire (restaurant/shop)	33.33%	1
Rental Car	0.00%	0
Parking Operator/Ground Transportation	0.00%	0
Transportation Network Company (Taxi/Ride sharing service)	0.00%	0
Other (please specify)	0.00%	0
TOTAL		3

#	Other (please specify)	Date
	There are no responses.	

Q14 Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

Answered: 1 Skipped: 4

#	Responses	Date
1	more storage and additional stores.	5/11/2017 3:18 PM

Q15 What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

Answered: 1 Skipped: 4

#	Responses	Date
1	35	5/10/2017 5:06 PM

Q16 Please indicate your level of satisfaction with each of the following

Answered: 2 Skipped: 3

	Below Expectations	Meets Expectations	Exceeds Expectations	This is not applicable to me	Total	Weighted Average
Airfield	0.00% 0	100.00% 2	0.00% 0	0.00% 0	2	2.00
Terminal facilities	0.00% 0	100.00% 2	0.00% 0	0.00% 0	2	2.00
Groundskeeping	0.00% 0	50.00% 1	50.00% 1	0.00% 0	2	2.50
Security	0.00% 0	50.00% 1	50.00% 1	0.00% 0	2	2.50
Baggage Handling Procedures/Facilities	0.00% 0	100.00% 2	0.00% 0	0.00% 0	2	2.00
Ground Service Equipment Utilization	0.00% 0	100.00% 2	0.00% 0	0.00% 0	2	2.00
Navigational Aid (NAVAID)	0.00% 0	100.00% 2	0.00% 0	0.00% 0	2	2.00

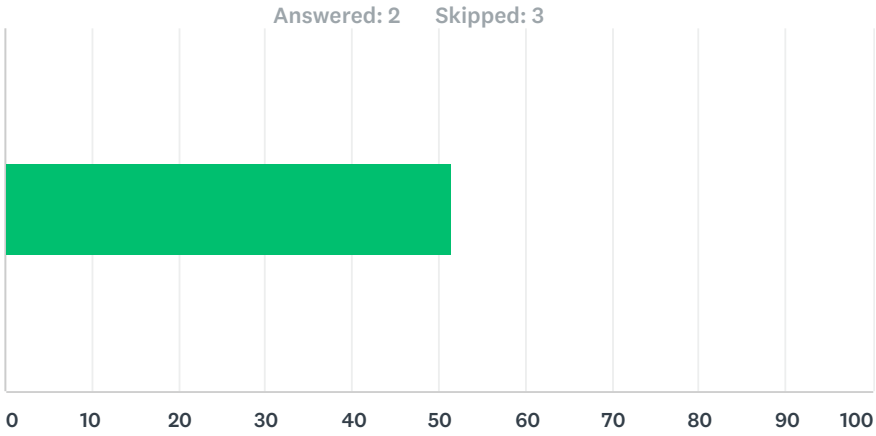
Q17 Is there any additional ground service equipment you would like to see available at GSP?

Answered: 2 Skipped: 3

Answer Choices	Responses	
No additions necessary	100.00%	2
This does not apply to me	0.00%	0
Additional GSE could include:	0.00%	0
TOTAL		2

#	Additional GSE could include:	Date
	There are no responses.	

Q18 How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)



Answer Choices	Average Number	Total Number	Responses
	52	103	2
Total Respondents: 2			

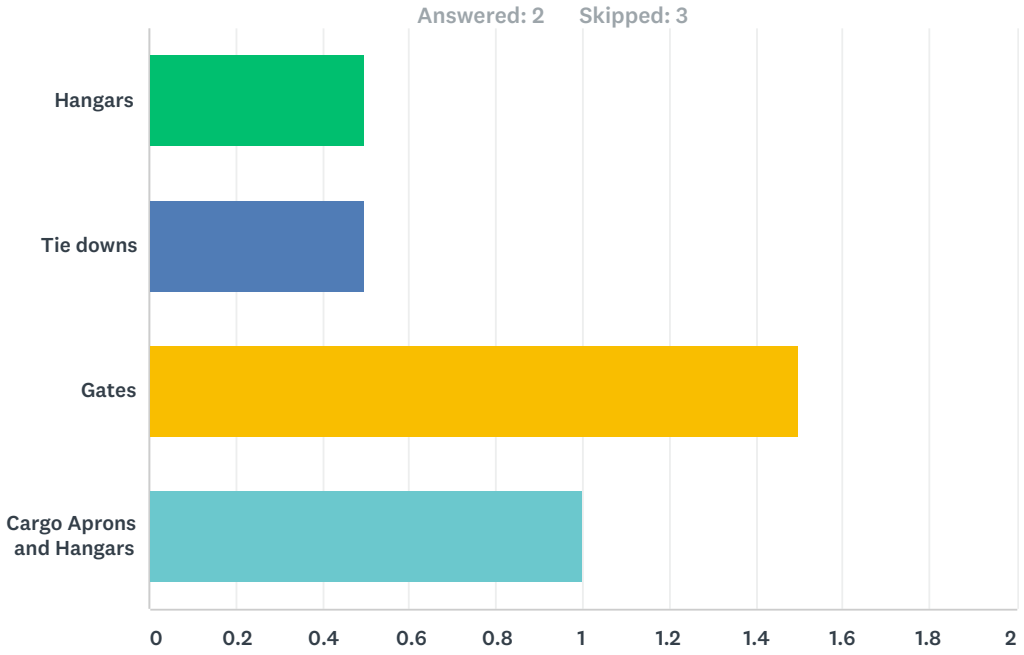
#		Date
1	53	5/15/2017 8:38 AM
2	50	5/10/2017 5:10 PM

Q19 How can this be improved?

Answered: 1 Skipped: 4

#	Responses	Date
1	More expedited on-call response time especially outside of regular business hours	5/10/2017 5:10 PM

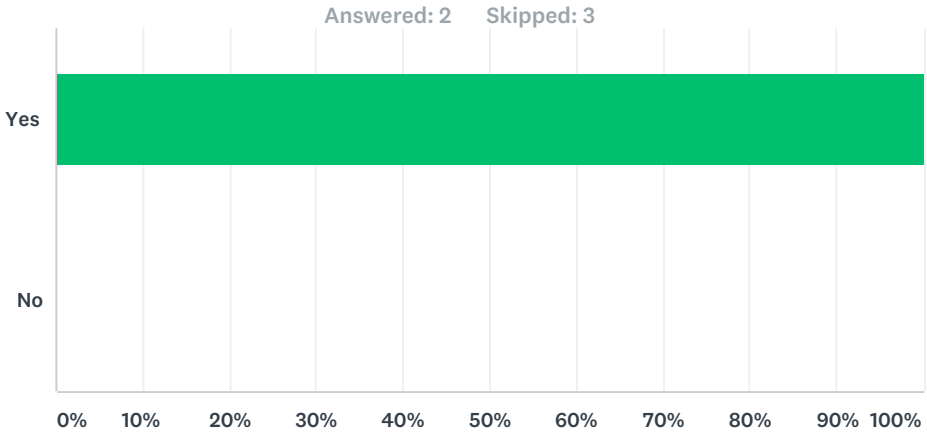
Q20 Please indicate whether the appropriate amount of each of the following are available at GSP:



	Below Expectations	Meets Expectations	Exceeds Expectations	This does not apply to me	Total	Weighted Average
Hangars	50.00% 1	0.00% 0	0.00% 0	50.00% 1	2	0.50
Tie downs	50.00% 1	0.00% 0	0.00% 0	50.00% 1	2	0.50
Gates	50.00% 1	50.00% 1	0.00% 0	0.00% 0	2	1.50
Cargo Aprons and Hangars	0.00% 0	50.00% 1	0.00% 0	50.00% 1	2	1.00

Q21 Does your company/organization participate in any recycling programs?

Answered: 2 Skipped: 3



Answer Choices	Responses	
Yes	100.00%	2
No	0.00%	0
TOTAL		2

#	If yes, please describe the program	Date
1	Must to in internally	5/15/2017 8:38 AM
2	We participate in onboard recycling	5/10/2017 5:11 PM

Q22 Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

Answered: 0 Skipped: 5

⚠ No matching responses.

Answer Choices	Responses	
Yes	0.00%	0
No	0.00%	0
TOTAL		0

#	If no, please explain	Date
	There are no responses.	

Q23 How does the amount of traffic congestion when entering the airport compare to nearby airports?

Answered: 0 Skipped: 5

⚠ No matching responses.

Answer Choices	Responses	
Traffic at GSP is similar compared to nearby airports	0.00%	0
Traffic at GSP is high compared to nearby airports	0.00%	0
Traffic at GSP is low compared to nearby airports	0.00%	0
I'm unsure/ This does not apply to me	0.00%	0
TOTAL		0

#	Please explain:	Date
	There are no responses.	

Q24 Is the current parking availability adequate for the needs of your employees and customers?

Answered: 0 Skipped: 5

⚠ No matching responses.

Answer Choices	Responses	
Yes	0.00%	0
No	0.00%	0
If no, please explain. (Location, space available, etc.)	0.00%	0
TOTAL		0

#	If no, please explain. (Location, space available, etc.)	Date
	There are no responses.	

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Wednesday, May 10, 2017 4:33:16 PM
Last Modified:	Wednesday, May 10, 2017 5:11:03 PM
Time Spent:	00:37:46
IP Address:	205.174.22.25

Page 2

Q1 35

How long has your company been a tenant at the airport (in years)?

Q2 12

How long have you worked at GSP (in years)?

Page 3

Q3

How would you rate the space your organization currently occupies?

2

Q4

If below expectations, please explain.

Ramp offices have damage cause by faulty airport HVAC sytem and was never repaired. The area hasn't been refreshed since we moved in over 30 years ago.

Page 4

Q5 Yes

Is the size of your tenant space appropriate for your company's business?

Q6 Yes

Is the location of your tenant space appropriate for your company's business?

Q7	**No,**
Is the quality of your tenant space appropriate for your company's business?	**If no, please explain** **Ramp Offices outdated, damaged drywall, sagging ceiling tiles, need to be completely gutted due to never refreshed by airport.**

Page 5

Q8

How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

3

Q9	**The VP of airport facilities responds at his convenience.**
If below expectations, please explain.	

Q10

How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

3

Q11	**VP of Facilities only follows up on issues he feels are relevant. When pressed his response was "if Delta doesn't like it they can always leave".**
If below expectations, please explain	

Page 6

Q12

List three words that describe each of the following at GSP.

Strengths(Airport conditions that support success)	**Administrative support staff, departmental managers and some executive staff are excellent. They try to make this a partnership and make us feel this is a true partnership even though some executives do not.**
Weaknesses(Airport conditions that work against success)	**Senior Airport Leadership doesn't understand the business of their tenant/customers. Give the impression they don't care.**
Opportunities(Market factors that can be capitalized)	**Remove the VP of Facilities and replace him with someone who is honest, trustworthy, who cares about airport tennants and values their business.**
Threats(Market factors that can jeopardize airport success)	**VP of Facilities telling the largest carrier at GSP if they don't like it here they can choose to leave. This person is despised by the majority of tennants at GSP and many GSP employees.**

Page 7

Q13

How does your business use the airport?

Air Passenger Carrier

Page 8

Q14

Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

Respondent skipped this question

Page 9

Q15

What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

35

Page 10

Q16

Please indicate your level of satisfaction with each of the following

Airfield	Meets Expectations
Terminal facilities	Meets Expectations
Groundskeeping	Exceeds Expectations
Security	Exceeds Expectations
Baggage Handling Procedures/Facilities	Meets Expectations
Ground Service Equipment Utilization	Meets Expectations
Navigational Aid (NAVAID)	Meets Expectations

Q17

Is there any additional ground service equipment you would like to see available at GSP?

No additions necessary

Page 11

Q18

How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)

50

Q19

How can this be improved?

More expedited on-call response time especially outside of regular business hours

Page 12

Q20

Please indicate whether the appropriate amount of each of the following are available at GSP:

Hangars	This does not apply to me
Tie downs	This does not apply to me
Gates	Below Expectations
Cargo Aprons and Hangars	This does not apply to me

Page 13

Q21

Does your company/organization participate in any recycling programs?

Yes,

If yes, please describe the program
We participate in onboard recycling

Page 14

Q22

Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

Respondent skipped this question

Page 15

Q23

How does the amount of traffic congestion when entering the airport compare to nearby airports?

Respondent skipped this question

Page 16

Q24

Is the current parking availability adequate for the needs of your employees and customers?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Thursday, May 11, 2017 3:13:45 PM
Last Modified:	Thursday, May 11, 2017 3:17:59 PM
Time Spent:	00:04:13
IP Address:	75.141.78.242

Page 2

Q1 How long has your company been a tenant at the airport (in years)?	7
Q2 How long have you worked at GSP (in years)?	4

Page 3

Q3 How would you rate the space your organization currently occupies?

7

Q4 If below expectations, please explain.	concourse space is too small

Page 4

Q5 Is the size of your tenant space appropriate for your company's business?	No, If no, please explain not big enough
Q6 Is the location of your tenant space appropriate for your company's business?	Yes

Q7

Is the quality of your tenant space appropriate for your company's business?

Yes

Page 5

Q8

How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

6

Q9

If below expectations, please explain.

roof leaks

Q10

How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

6

Q11

If below expectations, please explain

never hear about diversions or charters

Page 6

Q12

List three words that describe each of the following at GSP.

Strengths(Airport conditions that support success)	clean
Weaknesses(Airport conditions that work against success)	space size and storage
Opportunities(Market factors that can be capitalized)	low fare airlines
Threats(Market factors that can jeopardize airport success)	charlotte/ more southwest flights

Page 7

Q13

How does your business use the airport?

Concessionaire (restaurant/shop)

Page 8

Q14

Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

more storage and additional stores.

Page 9

Q15

What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

Respondent skipped this question

Page 10

Q16

Please indicate your level of satisfaction with each of the following

Respondent skipped this question

Q17

Is there any additional ground service equipment you would like to see available at GSP?

Respondent skipped this question

Page 11

Q18

How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)

Respondent skipped this question

Q19

How can this be improved?

Respondent skipped this question

Page 12

Q20

Please indicate whether the appropriate amount of each of the following are available at GSP:

Respondent skipped this question

Page 13

Q21

Does your company/organization participate in any recycling programs?

Respondent skipped this question

Page 14

Q22

Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

Respondent skipped this question

Page 15

Q23

How does the amount of traffic congestion when entering the airport compare to nearby airports?

Respondent skipped this question

Page 16

Q24

Is the current parking availability adequate for the needs of your employees and customers?

Respondent skipped this question

INCOMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Thursday, May 11, 2017 4:31:41 PM
Last Modified:	Thursday, May 11, 2017 4:35:45 PM
Time Spent:	00:04:03
IP Address:	104.129.196.119

Page 2

Q1 How long has your company been a tenant at the airport (in years)?	25
Q2 How long have you worked at GSP (in years)?	17

Page 3

Q3 How would you rate the space your organization currently occupies?

27

Q4 If below expectations, please explain.	We would like to renovate but plans are continuly pushed aside.

Page 4

Q5 Is the size of your tenant space appropriate for your company's business?	Yes
Q6 Is the location of your tenant space appropriate for your company's business?	Yes

Q7

Is the quality of your tenant space appropriate for your company's business?

No,

If no, please explain
Still looking to upgrade and renovate

Page 5

Q8

How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

75

Q9

If below expectations, please explain.

Respondent skipped this question

Q10

How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

65

Q11

If below expectations, please explain

Respondent skipped this question

Page 6

Q12

List three words that describe each of the following at GSP.

Respondent skipped this question

Page 7

Q13

How does your business use the airport?

Respondent skipped this question

Page 8

Q14

Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

Respondent skipped this question

Page 9

Q15

What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

Respondent skipped this question

Page 10

Q16

Please indicate your level of satisfaction with each of the following

Respondent skipped this question

Q17

Is there any additional ground service equipment you would like to see available at GSP?

Respondent skipped this question

Page 11

Q18

How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)

Respondent skipped this question

Q19

How can this be improved?

Respondent skipped this question

Page 12

Q20

Please indicate whether the appropriate amount of each of the following are available at GSP:

Respondent skipped this question

Page 13

Q21

Does your company/organization participate in any recycling programs?

Respondent skipped this question

Page 14

Q22

Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

Respondent skipped this question

Page 15

Q23

How does the amount of traffic congestion when entering the airport compare to nearby airports?

Respondent skipped this question

Page 16

Q24

Is the current parking availability adequate for the needs of your employees and customers?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Monday, May 15, 2017 8:29:20 AM
Last Modified:	Monday, May 15, 2017 8:38:24 AM
Time Spent:	00:09:04
IP Address:	104.129.194.124

Page 2

Q1

How long has your company been a tenant at the airport (in years)?

30

Q2

How long have you worked at GSP (in years)?

Respondent skipped this question

Page 3

Q3

How would you rate the space your organization currently occupies?

35

Q4

If below expectations, please explain.

facilities are old and need to be refurbished

Page 4

Q5

Is the size of your tenant space appropriate for your company's business?

Yes

Q6

Is the location of your tenant space appropriate for your company's business?

Yes

Q7

Is the quality of your tenant space appropriate for your company's business?

No,

If no, please explain
the office is not clean and services are poor

Page 5

Q8

How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

21

Q9

If below expectations, please explain.

We have to call them

Q10

How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

2

Q11

If below expectations, please explain

Issues are not addressed in a timely mannor

Page 6

Q12

List three words that describe each of the following at GSP.

Strengths(Airport conditions that support success)	fuel price
Weaknesses(Airport conditions that work against success)	old facilities
Opportunities(Market factors that can be capitalized)	long range contracts for fuel
Threats(Market factors that can jeopardize airport success)	unresponsive and uncooprative

Page 7

Q13

How does your business use the airport?

General Aviation

Page 8

Q14

Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

Respondent skipped this question

Page 9

Q15

What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

Respondent skipped this question

Page 10

Q16

Please indicate your level of satisfaction with each of the following

Airfield	Meets Expectations
Terminal facilities	Meets Expectations
Groundskeeping	Meets Expectations
Security	Meets Expectations
Baggage Handling Procedures/Facilities	Meets Expectations
Ground Service Equipment Utilization	Meets Expectations
Navigational Aid (NAVAID)	Meets Expectations

Q17

Is there any additional ground service equipment you would like to see available at GSP?

No additions necessary

Page 11

Q18

How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)

53

Q19

How can this be improved?

Respondent skipped this question

Page 12

Q20

Please indicate whether the appropriate amount of each of the following are available at GSP:

Hangars	Below Expectations
Tie downs	Below Expectations
Gates	Meets Expectations
Cargo Aprons and Hangars	Meets Expectations

Page 13

Q21

Does your company/organization participate in any recycling programs?

Yes,

If yes, please describe the program Must to in internally

Page 14

Q22

Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

Respondent skipped this question

Page 15

Q23

How does the amount of traffic congestion when entering the airport compare to nearby airports?

Respondent skipped this question

Page 16

Q24

Is the current parking availability adequate for the needs of your employees and customers?

Respondent skipped this question

INCOMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, May 16, 2017 8:53:50 AM
Last Modified:	Tuesday, May 16, 2017 9:01:05 AM
Time Spent:	00:07:14
IP Address:	216.81.81.81

Page 2

Q1 How long has your company been a tenant at the airport (in years)?	15
Q2 How long have you worked at GSP (in years)?	1

Page 3

Q3 How would you rate the space your organization currently occupies?	0
Q4 If below expectations, please explain.	We are expecting to move into the new TSA space in the next few months. The existing space needs updating.

Page 4

Q5 Is the size of your tenant space appropriate for your company's business?	Respondent skipped this question
Q6 Is the location of your tenant space appropriate for your company's business?	Respondent skipped this question

Q7

Is the quality of your tenant space appropriate for your company's business?

Respondent skipped this question

Page 5

Q8

How would you rate the frequency of GSP's communication regarding issues that are relevant to your tenancy?

Respondent skipped this question

Q9

If below expectations, please explain.

Respondent skipped this question

Q10

How would you rate the quality of GSP's communication regarding issues that are relevant to your tenancy?

Respondent skipped this question

Q11

If below expectations, please explain

Respondent skipped this question

Page 6

Q12

List three words that describe each of the following at GSP.

Respondent skipped this question

Page 7

Q13

How does your business use the airport?

Respondent skipped this question

Page 8

Q14

Given your projection of future business, what improvements would you like to see at GSP over the next 10 years?

Respondent skipped this question

Page 9

Q15

What is the average turnaround time for your operations (the elapsed time between arrival and departure in minutes)?

Respondent skipped this question

Page 10

Q16

Please indicate your level of satisfaction with each of the following

Respondent skipped this question

Q17

Is there any additional ground service equipment you would like to see available at GSP?

Respondent skipped this question

Page 11

Q18

How responsive is GSP when providing services during inclement weather? (snow, ice, etc.)

Respondent skipped this question

Q19

How can this be improved?

Respondent skipped this question

Page 12

Q20

Please indicate whether the appropriate amount of each of the following are available at GSP:

Respondent skipped this question

Page 13

Q21

Does your company/organization participate in any recycling programs?

Respondent skipped this question

Page 14

Q22

Do current airport users have satisfactory access to the airport and your facilities with the existing airport roadway and circulation infrastructure?

Respondent skipped this question

Page 15

Q23

How does the amount of traffic congestion when entering the airport compare to nearby airports?

Respondent skipped this question

Page 16

Q24

Is the current parking availability adequate for the needs of your employees and customers?

Respondent skipped this question

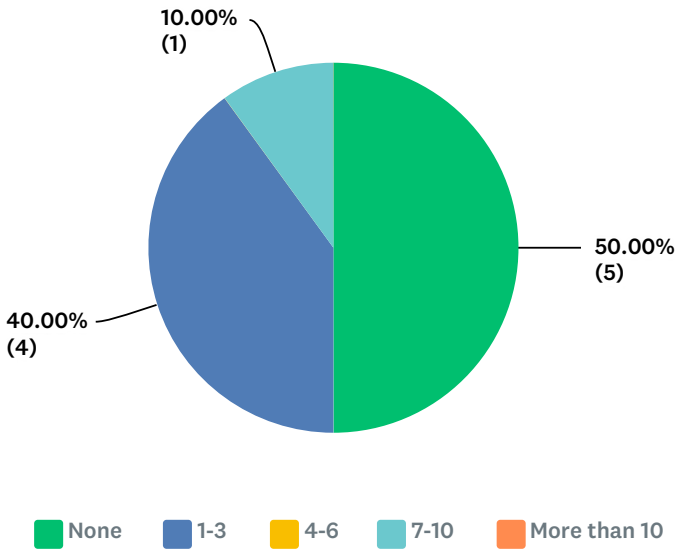
Q1 In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Answered: 10 Skipped: 0

#	Responses	Date
1	41075	5/17/2017 12:34 PM
2	29302	5/12/2017 4:41 PM
3	28037	5/11/2017 11:04 AM
4	77339	5/11/2017 11:04 AM
5	29651	4/28/2017 1:57 PM
6	40223	4/27/2017 1:12 PM
7	29033	4/26/2017 2:59 PM
8	30316	4/25/2017 1:13 PM
9	29687	4/25/2017 10:22 AM
10	38139	4/25/2017 9:08 AM

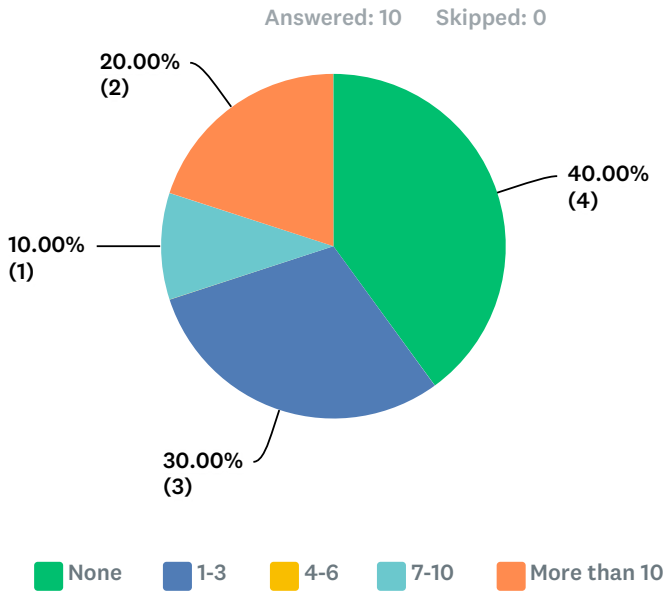
Q2 In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

Answered: 10 Skipped: 0



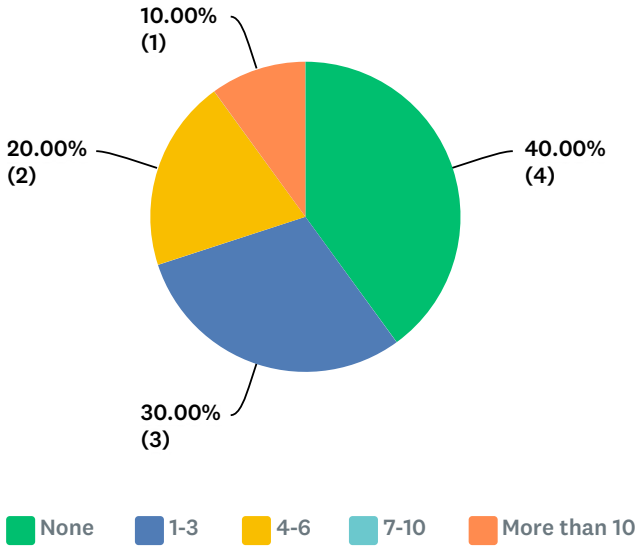
Q3 In the last 12 months, how many trips did you make using GSP for business purposes?

Answered: 10 Skipped: 0



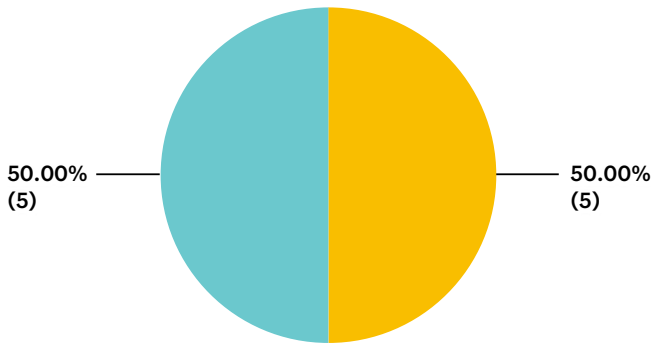
Q4 How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

Answered: 10 Skipped: 0



Q5 How would you characterize your knowledge/awareness of the airport?

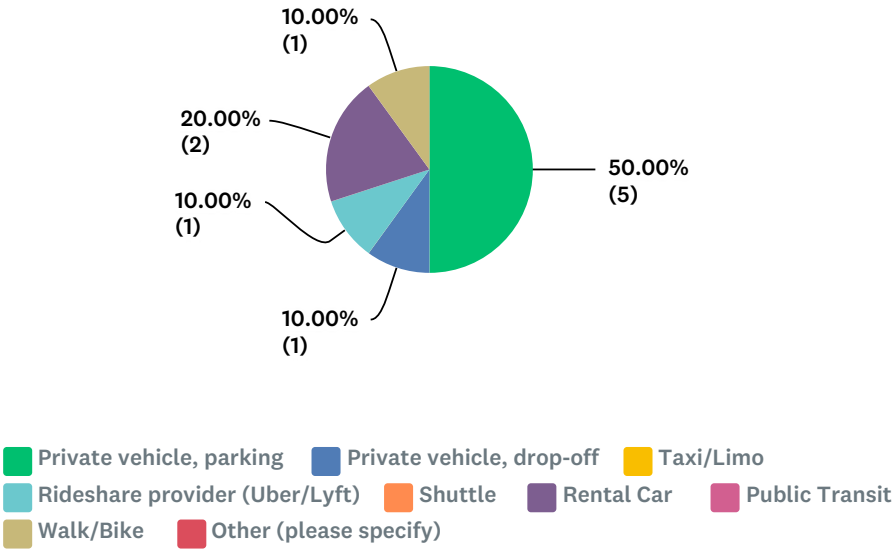
Answered: 10 Skipped: 0



I didn't know the community had an airport.
I knew the community had an airport, but I'm not familiar with it (size, location, et...
Somewhat familiar
Very familiar

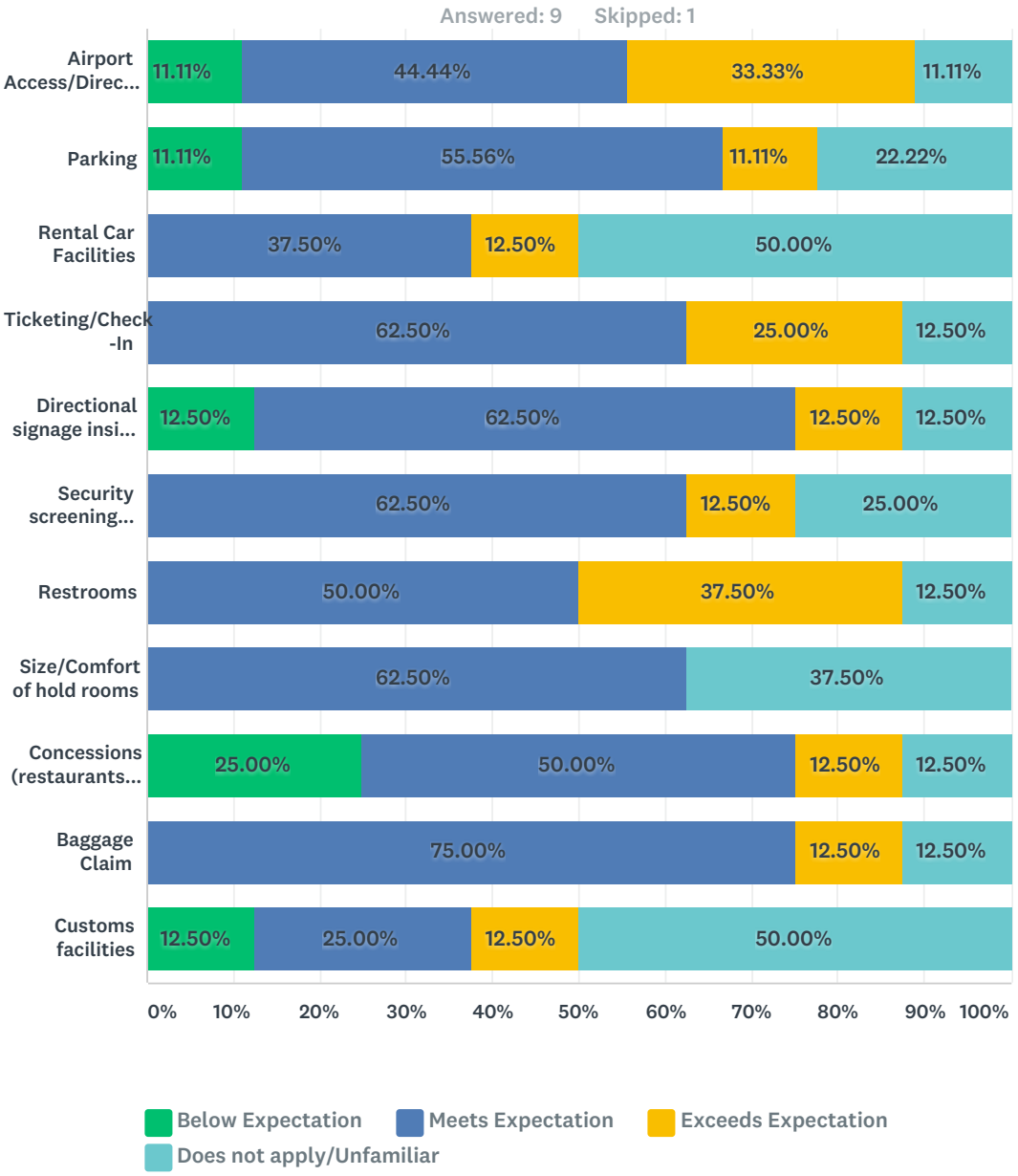
Q6 How do you primarily get to/from the airport?

Answered: 10 Skipped: 0



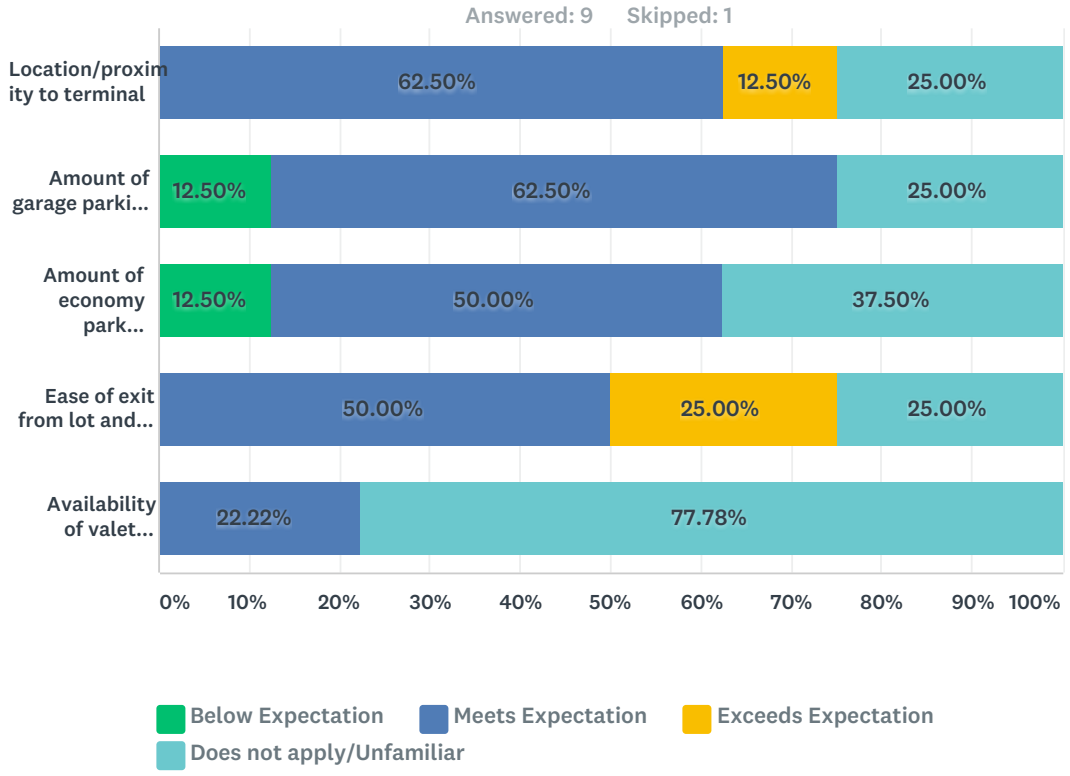
#	Other (please specify)	Date
	There are no responses.	

Q7 How would you rank each of the following at GSP?



#	If below expectations, please explain.	Date
1	Not enough options	5/11/2017 11:06 AM

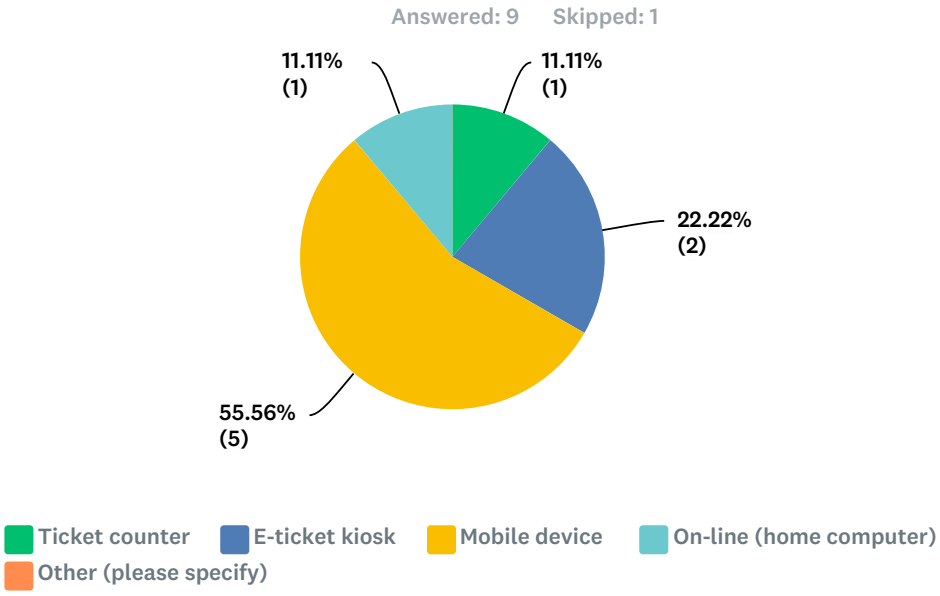
Q8 Please indicate how satisfied you are with each aspect of the parking layout at GSP.



#	If below expectations, please explain.	Date
	There are no responses.	

Q9 Where do you usually check in for your flight?

Answered: 9 Skipped: 1



#	Other (please specify)	Date
	There are no responses.	

Q10 Please indicate your overall impression of the airport.

Answered: 4 Skipped: 6

#	Responses	Date
1	GSP is a great facility and the recent upgrades are nice	5/12/2017 4:53 PM
2	Better than what it used to be	5/11/2017 11:07 AM
3	good and getting better	4/28/2017 2:00 PM
4	GSP is beautiful. It's always been my favorite small airport and traveling around the country has only solidified that feeling. I feel the local flair is an excellent way to showcase our airport.	4/25/2017 10:25 AM

Q11 What three words would you use to describe GSP?

Answered: 4 Skipped: 6

#	Responses	Date
1	Great Small Airport	5/12/2017 4:53 PM
2	New and improved	5/11/2017 11:07 AM
3	small, nice, new	4/28/2017 2:00 PM
4	Bright, convenient, personal	4/25/2017 10:25 AM

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, April 25, 2017 9:07:49 AM
Last Modified:	Tuesday, April 25, 2017 9:09:39 AM
Time Spent:	00:01:49
IP Address:	192.189.187.102

Page 2

Q1

38139

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Page 3

Q2

None

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

Page 4

Q3

None

In the last 12 months, how many trips did you make using GSP for business purposes?

Page 5

Q4

None

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

Page 6

Q5	
How would you characterize your knowledge/awareness of the airport?	Somewhat familiar

Page 7

Q6	
How do you primarily get to/from the airport?	Rental Car

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Does not apply/Unfamiliar
Parking	Does not apply/Unfamiliar
Rental Car Facilities	Does not apply/Unfamiliar
Ticketing/Check-In	Does not apply/Unfamiliar
Directional signage inside the terminal	Does not apply/Unfamiliar
Security screening process	Does not apply/Unfamiliar
Restrooms	Does not apply/Unfamiliar
Size/Comfort of hold rooms	Does not apply/Unfamiliar
Concessions (restaurants/shops)	Does not apply/Unfamiliar
Baggage Claim	Does not apply/Unfamiliar
Customs facilities	Does not apply/Unfamiliar

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Does not apply/Unfamiliar
Amount of garage parking availability	Does not apply/Unfamiliar
Amount of economy parking availability	Does not apply/Unfamiliar
Ease of exit from lot and parking options	Does not apply/Unfamiliar
Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Where do you usually check in for your flight?

On-line (home computer)

Page 11

Q10

Please indicate your overall impression of the airport.

Respondent skipped this question

Q11

What three words would you use to describe GSP?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, April 25, 2017 10:22:19 AM
Last Modified:	Tuesday, April 25, 2017 10:24:40 AM
Time Spent:	00:02:21
IP Address:	68.115.235.34

Page 2

Q1

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

29687

Page 3

Q2

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

None

Page 4

Q3

In the last 12 months, how many trips did you make using GSP for business purposes?

None

Page 5

Q4

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

4-6

Page 6

Q5	Somewhat familiar
How would you characterize your knowledge/awareness of the airport?	

Page 7

Q6	Private vehicle, parking
How do you primarily get to/from the airport?	

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Exceeds Expectation
Parking	Exceeds Expectation
Rental Car Facilities	Does not apply/Unfamiliar
Ticketing/Check-In	Exceeds Expectation
Directional signage inside the terminal	Exceeds Expectation
Security screening process	Exceeds Expectation
Restrooms	Exceeds Expectation
Size/Comfort of hold rooms	Does not apply/Unfamiliar
Concessions (restaurants/shops)	Exceeds Expectation
Baggage Claim	Exceeds Expectation
Customs facilities	Exceeds Expectation

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Exceeds Expectation
Amount of garage parking availability	Meets Expectation
Amount of economy parking availability	Does not apply/Unfamiliar
Ease of exit from lot and parking options	Exceeds Expectation
Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Mobile device

Where do you usually check in for your flight?

Page 11

Q10

Please indicate your overall impression of the airport.

GSP is beautiful. It's always been my favorite small airport and traveling around the country has only solidified that feeling. I feel the local flair is an excellent way to showcase our airport.

Q11

Bright, convenient, personal

What three words would you use to describe GSP?

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Tuesday, April 25, 2017 1:12:47 PM
Last Modified:	Tuesday, April 25, 2017 1:15:18 PM
Time Spent:	00:02:31
IP Address:	205.174.22.25

Page 2

Q1

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

30316

Page 3

Q2

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

None

Page 4

Q3

In the last 12 months, how many trips did you make using GSP for business purposes?

More than 10

Page 5

Q4

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

More than 10

Page 6

Q5

How would you characterize your knowledge/awareness of the airport?

Somewhat familiar

Page 7

Q6

How do you primarily get to/from the airport?

Rideshare provider (Uber/Lyft)

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Meets Expectation
Parking	Does not apply/Unfamiliar
Rental Car Facilities	Does not apply/Unfamiliar
Ticketing/Check-In	Meets Expectation
Directional signage inside the terminal	Meets Expectation
Security screening process	Meets Expectation
Restrooms	Exceeds Expectation
Size/Comfort of hold rooms	Meets Expectation
Concessions (restaurants/shops)	Meets Expectation
Baggage Claim	Meets Expectation
Customs facilities	Does not apply/Unfamiliar

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Does not apply/Unfamiliar
Amount of garage parking availability	Does not apply/Unfamiliar
Amount of economy parking availability	Does not apply/Unfamiliar
Ease of exit from lot and parking options	Does not apply/Unfamiliar
Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Where do you usually check in for your flight?

Mobile device

Page 11

Q10

Please indicate your overall impression of the airport.

Respondent skipped this question

Q11

What three words would you use to describe GSP?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Wednesday, April 26, 2017 2:59:02 PM
Last Modified:	Wednesday, April 26, 2017 3:47:28 PM
Time Spent:	00:48:26
IP Address:	167.7.247.52

Page 2

Q1

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

29033

Page 3

Q2

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

None

Page 4

Q3

In the last 12 months, how many trips did you make using GSP for business purposes?

None

Page 5

Q4

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

1-3

Page 6

Q5 **How would you characterize your knowledge/awareness of the airport?**	Very familiar

Page 7

Q6 **How do you primarily get to/from the airport?**	Private vehicle, parking

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Exceeds Expectation
Parking	Meets Expectation
Rental Car Facilities	Meets Expectation
Ticketing/Check-In	Meets Expectation
Directional signage inside the terminal	Meets Expectation
Security screening process	Meets Expectation
Restrooms	Meets Expectation
Size/Comfort of hold rooms	Does not apply/Unfamiliar
Concessions (restaurants/shops)	Meets Expectation
Baggage Claim	Meets Expectation
Customs facilities	Does not apply/Unfamiliar

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Meets Expectation
Amount of garage parking availability	Below Expectation
Amount of economy parking availability	Meets Expectation
Ease of exit from lot and parking options	Meets Expectation
Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Where do you usually check in for your flight?

Ticket counter

Page 11

Q10

Please indicate your overall impression of the airport.

Respondent skipped this question

Q11

What three words would you use to describe GSP?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Friday, April 28, 2017 1:56:53 PM
Last Modified:	Friday, April 28, 2017 2:00:33 PM
Time Spent:	00:03:40
IP Address:	75.141.78.3

Page 2

Q1 29651

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Page 3

Q2 1-3

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

Page 4

Q3 1-3

In the last 12 months, how many trips did you make using GSP for business purposes?

Page 5

Q4 1-3

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

Page 6

Q5	
How would you characterize your knowledge/awareness of the airport?	Very familiar

Page 7

Q6	
How do you primarily get to/from the airport?	Private vehicle, drop-off

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Meets Expectation
Parking	Meets Expectation
Rental Car Facilities	Exceeds Expectation
Ticketing/Check-In	Meets Expectation
Directional signage inside the terminal	Below Expectation
Security screening process	Meets Expectation
Restrooms	Exceeds Expectation
Size/Comfort of hold rooms	Meets Expectation
Concessions (restaurants/shops)	Below Expectation
Baggage Claim	Meets Expectation
Customs facilities	Meets Expectation

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Meets Expectation
Amount of garage parking availability	Meets Expectation
Amount of economy parking availability	Below Expectation
Ease of exit from lot and parking options	Meets Expectation
Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Where do you usually check in for your flight?

E-ticket kiosk

Page 11

Q10

Please indicate your overall impression of the airport.

good and getting better

Q11

What three words would you use to describe GSP?

small, nice, new

INCOMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Thursday, May 11, 2017 11:04:12 AM
Last Modified:	Thursday, May 11, 2017 11:05:12 AM
Time Spent:	00:00:59
IP Address:	155.178.180.6

Page 2

Q1

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

28037

Page 3

Q2

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

None

Page 4

Q3

In the last 12 months, how many trips did you make using GSP for business purposes?

More than 10

Page 5

Q4

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

None

Page 6

Q5

How would you characterize your knowledge/awareness of the airport?

Very familiar

Page 7

Q6

How do you primarily get to/from the airport?

Private vehicle, parking

Page 8

Q7

How would you rank each of the following at GSP?

Respondent skipped this question

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Respondent skipped this question

Page 10

Q9

Where do you usually check in for your flight?

Respondent skipped this question

Page 11

Q10

Please indicate your overall impression of the airport.

Respondent skipped this question

Q11

What three words would you use to describe GSP?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Thursday, May 11, 2017 11:03:15 AM
Last Modified:	Thursday, May 11, 2017 11:07:25 AM
Time Spent:	00:04:09
IP Address:	107.77.201.194

Page 2

Q1

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

77339

Page 3

Q2

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

7-10

Page 4

Q3

In the last 12 months, how many trips did you make using GSP for business purposes?

7-10

Page 5

Q4

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

None

Page 6

Q5

How would you characterize your knowledge/awareness of the airport?

Very familiar

Page 7

Q6

How do you primarily get to/from the airport?

Private vehicle, parking

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Meets Expectation
Parking	Meets Expectation
Rental Car Facilities	Meets Expectation
Ticketing/Check-In	Meets Expectation
Directional signage inside the terminal	Meets Expectation
Security screening process	Does not apply/Unfamiliar
Restrooms	Meets Expectation
Size/Comfort of hold rooms	Meets Expectation
Concessions (restaurants/shops)	Below Expectation
Baggage Claim	Meets Expectation
Customs facilities	Below Expectation

If below expectations, please explain.
Not enough options

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Meets Expectation
Amount of garage parking availability	Meets Expectation
Amount of economy parking availability	Meets Expectation
Ease of exit from lot and parking options	Meets Expectation
Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Mobile device

Where do you usually check in for your flight?

Page 11

Q10

Please indicate your overall impression of the airport.

Better than what it used to be

Q11

New and improved

What three words would you use to describe GSP?

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Thursday, April 27, 2017 1:11:17 PM
Last Modified:	Thursday, May 11, 2017 12:23:52 PM
Time Spent:	Over a week
IP Address:	153.2.246.37

Page 2

Q1 40223

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Page 3

Q2 1-3

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

Page 4

Q3 1-3

In the last 12 months, how many trips did you make using GSP for business purposes?

Page 5

Q4 None

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

Page 6

Q5

How would you characterize your knowledge/awareness of the airport?

Somewhat familiar

Page 7

Q6

How do you primarily get to/from the airport?

Rental Car

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Meets Expectation
Parking	Meets Expectation
Rental Car Facilities	Meets Expectation
Ticketing/Check-In	Meets Expectation
Directional signage inside the terminal	Meets Expectation
Security screening process	Meets Expectation
Restrooms	Meets Expectation
Size/Comfort of hold rooms	Meets Expectation
Concessions (restaurants/shops)	Meets Expectation
Baggage Claim	Meets Expectation
Customs facilities	Meets Expectation

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Meets Expectation
Amount of garage parking availability	Meets Expectation
Amount of economy parking availability	Meets Expectation
Ease of exit from lot and parking options	Meets Expectation
Availability of valet parking	Meets Expectation

Page 10

Q9

Where do you usually check in for your flight?

Mobile device

Page 11

Q10

Please indicate your overall impression of the airport.

Respondent skipped this question

Q11

What three words would you use to describe GSP?

Respondent skipped this question

COMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Friday, May 12, 2017 4:40:43 PM
Last Modified:	Friday, May 12, 2017 4:53:02 PM
Time Spent:	00:12:19
IP Address:	192.146.148.185

Page 2

Q1

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

29302

Page 3

Q2

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

1-3

Page 4

Q3

In the last 12 months, how many trips did you make using GSP for business purposes?

None

Page 5

Q4

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

4-6

Page 6

Q5 **How would you characterize your knowledge/awareness of the airport?**	Somewhat familiar

Page 7

Q6 **How do you primarily get to/from the airport?**	Private vehicle, parking

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Exceeds Expectation
Parking	Meets Expectation
Rental Car Facilities	Does not apply/Unfamiliar
Ticketing/Check-In	Exceeds Expectation
Directional signage inside the terminal	Meets Expectation
Security screening process	Meets Expectation
Restrooms	Meets Expectation
Size/Comfort of hold rooms	Meets Expectation
Concessions (restaurants/shops)	Meets Expectation
Baggage Claim	Meets Expectation
Customs facilities	Does not apply/Unfamiliar

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Location/proximity to terminal	Meets Expectation
Amount of garage parking availability	Meets Expectation
Amount of economy parking availability	Meets Expectation
Ease of exit from lot and parking options	Exceeds Expectation
Availability of valet parking	Meets Expectation

Page 10

Q9

Where do you usually check in for your flight?

E-ticket kiosk

Page 11

Q10

Please indicate your overall impression of the airport.

GSP is a great facility and the recent upgrades are nice

Q11

What three words would you use to describe GSP?

Great Small Airport

INCOMPLETE

Collector:	Web Link 1 (Web Link)
Started:	Wednesday, May 17, 2017 12:33:21 PM
Last Modified:	Wednesday, May 17, 2017 12:35:45 PM
Time Spent:	00:02:24
IP Address:	167.7.247.52

Page 2

Q1 41075

In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

Page 3

Q2 1-3

In the past 12 months, how many trips did you make using GSP, for leisure or non-business purposes?

Page 4

Q3 1-3

In the last 12 months, how many trips did you make using GSP for business purposes?

Page 5

Q4 1-3

How many times in the past 12 months have you picked up or dropped someone off at GSP, or visited the airport for any other reason?

Page 6

Q5

How would you characterize your knowledge/awareness of the airport?

Very familiar

Page 7

Q6

How do you primarily get to/from the airport?

Walk/Bike

Page 8

Q7

How would you rank each of the following at GSP?

Airport Access/Directional Signage	Below Expectation
Parking	Below Expectation

Page 9

Q8

Please indicate how satisfied you are with each aspect of the parking layout at GSP.

Availability of valet parking	Does not apply/Unfamiliar

Page 10

Q9

Where do you usually check in for your flight?

Mobile device

Page 11

Q10

Please indicate your overall impression of the airport.

Respondent skipped this question

Q11

What three words would you use to describe GSP?

Respondent skipped this question

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT

2040 WINGSPAN
A VISION FOR THE FUTURE

DECEMBER 2019
AIRPORT MASTER PLAN UPDATE
APPENDIX D: COST ESTIMATES

McFarland Johnson

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
ENGINEERS ESTIMATE

	PROJECT	CONSTRUCTION	DESIGN	PROFESSIONAL SERVICES	TOTAL	
A	RUNWAY REHABILITATION	$11,071,312.50	$709,000.00	$1,063,000.00	$12,843,312.50	
#1 / #8	RELOCATED AND EXPANDED EMPLOYEE PARKING LOT	$2,260,050.00	$181,000.00	$271,000.00	$2,712,050.00	
#2	ECONOMY SURFACE LOT EXPANSION	$919,950.00	$74,000.00	$110,000.00	$1,103,950.00	
#3	AVIATION PARKWAY IMPROVEMENT - PHASE 1	$856,000.00	$69,000.00	$103,000.00	$1,028,000.00	
#4	ARFF RELOCATION (BUILDING, PARKING LOT, ROAD AND APRON)	$6,491,835.00	$519,000.00	$779,000.00	$7,789,835.00	
	(ARFF BUILDING UNDER DESIGN WITH WK DICKSON - GET UPDATED COSTS FROM AIRPORT)					
#5	PARKING GARAGE C - UTILITY UPGRADE	$775,000.00	$62,000.00	$93,000.00	$930,000.00	
	(CURRENTY UNDER DESIGN - GET UPDATED COSTS FROM AIRPORT)					
#7	AIR CARGO EXPANSION - PHASE 2	$11,618,900.00	$930,000.00	$1,394,000.00	$13,942,900.00	
#7	AIR CARGO EXPANSION - PHASE 2 - HANGAR AND PARKING	$19,256,450.00	$1,541,000.00	$2,311,000.00	$23,108,450.00	
#9	CONSTRUCT GARAGE C AND GSP DRIVE REALIGNMENT	$47,910,690.50	$3,333,000.00	$4,999,000.00	$56,242,690.50	
#10	AIR CARRIER APRON BOARDING BRIDGE - (A0.5))	$2,119,900.00	$170,000.00	$254,000.00	$2,543,900.00	
#10	AIR CARRIER APRON BOARDING BRIDGE - (B4.5)	$1,413,700.00	$113,000.00	$170,000.00	$1,696,700.00	
#11	AIRPORT FUEL FARM EXPANSION - PHASE 1	$1,397,800.00	$112,000.00	$168,000.00	$1,677,800.00	
#12	CLOSURE OF TAXIWAY E AND F	$220,525.00	$14,000.00	$21,000.00	$255,525.00	
	DEMOLITION OF TAXIWAY E AND F	$687,750.00	$44,000.00	$66,000.00	$797,750.00	*
#13 / #17	FBO EXPANSION AND GA FIS RELOCATION	$1,621,000.00	$129,680.00	$194,520.00	$1,945,200.00	
#14 / #19	WIDEN APRON EDGE AT TAXIWAY L3 AND WIDEN TAXILANE AT GA APRON					
	(ASPHALT ALTERNATIVE)	$3,960,835.00	$254,000.00	$380,000.00	$4,594,835.00	*
	(CONCRETE ALTERNATIVE)	$5,064,585.00	$324,000.00	$486,000.00	$5,874,585.00	
#15 / #20	AIR CARRIER APRON REHABILITATION - (RIGHT) AND CONCOURSE EXPANSION	$10,091,600.00	$807,000.00	$1,211,000.00	$12,109,600.00	
#16 / #22	MAINTENANCE YARD EXPANSION - PHASE 1	$1,520,990.00	$122,000.00	$183,000.00	$1,825,990.00	
#18 / #23	NEW ECONOMY PARKING LOT - PHASE 1	$2,854,650.00	$228,000.00	$343,000.00	$3,425,650.00	
#21 / #26	AVIATION PARKWAY & GSP DRIVE NORTH INTERSECTION ROUNDABOUT	$695,645.00	$48,000.00	$73,000.00	$816,645.00	
#24	AIRFIELD ELECTRICAL VAULT RELOCATION	$1,723,000.00	$138,000.00	$207,000.00	$2,068,000.00	
#25	ARFF AND AIRFIELD ELECTRICAL VAULT DEMO	$452,000.00	$37,000.00	$55,000.00	$544,000.00	
#27	RUNWAY 22 ALSF-II	$4,802,200.00	$384,000.00	$576,000.00	$5,762,200.00	
#28	GA APRON EXPANSION - PHASE 1a - DESIGN AND SITE PREP	$1,075,135.00	$1,085,000.00	$112,000.00	$2,272,135.00	
#29	SOUTH MRO DEVELOPMENT AREA - PHASE 1 - DESIGN AND SITE PREP	$1,352,300.00	$1,684,000.00	$162,000.00	$3,198,300.00	
B	TAXIWAY INTERSECTION (TW L AND TW L4)	$1,619,075.00	$104,000.00	$155,000.00	$1,878,075.00	
	TOTAL	$139,184,293.00	$12,917,680.00	$15,493,520.00	$167,595,493.00	

* NOT INCLUDED IN TOTALS

PROJECT A

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
RUNWAY REHABILITATION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$671,000.00	$671,000.00
2	P-101	PAVEMENT MILLING (2")	SY	219,000	$5.00	$1,095,000.00
3	P-102	SAFETY AND SECURITY	LS	1	$314,000.00	$314,000.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$125,000.00	$125,000.00
5	M-103	RUNWAY CLOSURE MARKERS	EA	2	$3,000.00	$6,000.00
6	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$20,000.00	$20,000.00
7	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (2")	TON	26,400	$150.00	$3,960,000.00
8	P-602	BITUMINOUS PRIME COAT	GAL	62,700	$3.50	$219,450.00
9	P-605	ROUT, CLEAN AND SEAL CONCRETE JOINTS	LF	61,000	$6.00	$366,000.00
10	P-620	AIRFIELD MARKING	SF	185,000	$2.00	$370,000.00
11	P-621	RUNWAY GROOVING	SY	115,000	$2.00	$230,000.00
12	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
13	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
14		CONTINGENCY (20%)	LS	1	$1,476,200.00	$1,476,200.00
		CONSTRUCTION TOTAL				$8,857,050.00
		PREMIUM FOR NIGHT WORK (25%)				$2,214,262.50
		DESIGN (8%)				$709,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,063,000.00
		PROJECT TOTAL				$12,843,312.50

PROJECT #1 / #8

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
RELOCATED AND EXPANDED EMPLOYEE PARKING LOT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$171,200.00	$171,200.00
2	P-102	SAFETY AND SECURITY	LS	1	$80,000.00	$80,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$32,000.00	$32,000.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,300	$8.00	$26,400.00
5	P-152	ROCK EXCAVATION	CY	4,000	$50.00	$200,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	440	$100.00	$44,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
8	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	5,600	$60.00	$336,000.00
9	NCDOT	ASPHALT PAVEMENT (4")	TN	4,500	$140.00	$630,000.00
10	P-602	BITUMINOUS PRIME COAT	GAL	5,500	$3.50	$19,250.00
11	P-603	BITUMINOUS TACK COAT	GAL	1,800	$3.00	$5,400.00
12	P-610	CURB AND GUTTER	LF	2,100	$35.00	$73,500.00
13	P-620	PAVEMENT MARKING	SF	4,500	$2.00	$9,000.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
15	F-162	AUTOMATIC GATE WITH CARD READER	EA	1	$20,000.00	$20,000.00
16	F-162	AUTOMATIC GATE	EA	2	$15,000.00	$30,000.00
17	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
18	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
19		CONTINGENCY (20%)	LS	1	$376,700.00	$376,700.00
		CONSTRUCTION TOTAL				$2,260,050.00
		DESIGN (8%)				$181,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$271,000.00
		PROJECT TOTAL				$2,712,050.00

PROJECT #2

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
ECONOMY SURFACE LOT EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$69,700.00	$69,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$32,600.00	$32,600.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$13,000.00	$13,000.00
4	P-151	CLEARING AND GRUBBING	AC	3	$8,000.00	$24,000.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	1,300	$8.00	$10,400.00
6	P-152	ROCK EXCAVATION	CY	1,500	$50.00	$75,000.00
7	P-152	ROCK EXCAVATION FOR TRENCHING	CY	170	$100.00	$17,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$75,000.00	$75,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,100	$60.00	$126,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	1,700	$140.00	$238,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	2,100	$3.50	$7,350.00
12	P-603	BITUMINOUS TACK COAT	GAL	700	$3.00	$2,100.00
13	P-610	CURB AND GUTTER	LF	500	$35.00	$17,500.00
14	P-620	PAVEMENT MARKING	SF	1,200	$2.00	$2,400.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
16	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
17	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
18		CONTINGENCY (20%)	LS	1	$153,300.00	$153,300.00
		CONSTRUCTION TOTAL				$919,950.00
		DESIGN (8%)				$74,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$110,000.00
		PROJECT TOTAL				$1,103,950.00

PROJECT #4

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
ARFF BUILDING, PARKING LOT, ROAD AND APRON

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$491,800.00	$491,800.00
2	P-101	PAVEMENT REMOVAL	SY	1,000	$9.00	$9,000.00
3	P-101	BUILDING DEMOLITION	LS	1	$50,000.00	$50,000.00
4	P-101	ARFF BUILDING	SF	21,200	$150.00	$3,180,000.00
5	P-101	ARFF BUILDING UTILITIES	LS	1	$200,000.00	$200,000.00
6	P-102	SAFETY AND SECURITY	LS	1	$229,800.00	$229,800.00
7	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$91,900.00	$91,900.00
8	P-152	UNCLASSIFIED EXCAVATION	CY	5,000	$8.00	$40,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
10	P-304	CEMENT TREATED BASE COURSE (6")	SY	6,100	$30.00	$183,000.00
11	P-501	PORTLAND CEMENT CONCRETE(11")	SY	6,100	$110.00	$671,000.00
12	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,100	$50.00	$55,000.00
13	NCDOT	ASPHALT PAVEMENT (4")	TN	900	$130.00	$117,000.00
14	P-602	BITUMINOUS PRIME COAT	GAL	3,100	$3.50	$10,850.00
15	P-603	BITUMINOUS TACK COAT	GAL	1,600	$3.00	$4,800.00
16	P-620	AIRFIELD MARKING	SF	1,600	$2.00	$3,200.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
18	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
19	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
20	L-108	CABLE TRENCHING	LF	900	$2.00	$1,800.00
21	L-108	#8, 5KV, TYPE 'C' CABLE	LF	1,100	$2.00	$2,200.00
22	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	1,100	$1.85	$2,035.00
23	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	50	$65.00	$3,250.00
24	L-125	TAXIWAY LIGHTS (LED)	EA	12	$1,500.00	$18,000.00
25	L-125	AIRFIELD GUIDANCE SIGN	EA	2	$5,000.00	$10,000.00
26		CONTINGENCY (20%)	LS	1	$1,082,000.00	$1,082,000.00
		CONSTRUCTION TOTAL				$6,491,835.00
		DESIGN (8%)				$519,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$779,000.00
		PROJECT TOTAL				$7,789,835.00

PROJECT #7

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
CARGO APRON EXPANSION - PHASE 2

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$880,200.00	$880,200.00
2	P-102	SAFETY AND SECURITY	LS	1	$25,000.00	$25,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$25,000.00	$25,000.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	16,000	$8.00	$128,000.00
5	P-152	ROCK EXCAVATION	CY	17,100	$50.00	$855,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	200	$100.00	$20,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$20,000.00	$20,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	45,700	$30.00	$1,371,000.00
9	P-501	PORTLAND CEMENT CONCRETE (19")	SY	45,400	$140.00	$6,356,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$1,936,500.00	$1,936,500.00
		CONSTRUCTION TOTAL				$11,618,900.00
		DESIGN (8%)				$930,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,394,000.00
		PROJECT TOTAL				$13,942,900.00

PROJECT #7

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
CARGO APRON - PHASE 2 - HANGAR AND PARKING

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$500,000.00	$500,000.00
2	P-101	HANGAR BUILDING	SF	110,000	$125.00	$13,750,000.00
3	P-101	HANGAR UTILITIES	SF	110,000	$10.00	$1,100,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$32,600.00	$32,600.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$13,000.00	$13,000.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	2,000	$8.00	$16,000.00
7	P-152	ROCK EXCAVATION	CY	1,400	$50.00	$70,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	220	$100.00	$22,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,800	$60.00	$168,000.00
11	NCDOT	ASPHALT PAVEMENT (3")	TN	1,700	$140.00	$238,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	2,800	$3.50	$9,800.00
13	P-603	BITUMINOUS TACK COAT	GAL	900	$3.00	$2,700.00
14	P-610	CURB AND GUTTER	LF	650	$35.00	$22,750.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
16	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
17	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
18		CONTINGENCY (20%)	LS	1	$3,209,400.00	$3,209,400.00
		CONSTRUCTION TOTAL				$19,256,450.00
		DESIGN (8%)				$1,541,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$2,311,000.00
		PROJECT TOTAL				$23,108,450.00

PROJECT #9

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
RECONFIGURE GSP DRIVE TO TERMINAL & GARAGE C

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$3,156,200.00	$3,156,200.00
2	P-101	PAVEMENT MILLING (2")	SY	3,900	$4.00	$15,600.00
3	P-101	BRIDGE	LS	1	$2,250,000.00	$2,250,000.00
4	P-102	PARKING GARAGE	LS	1	$26,750,000.00	$26,750,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$1,474,800.00	$1,474,800.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$589,900.00	$589,900.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	400	$8.00	$3,200.00
8	P-152	ROCK EXCAVATION	CY	440	$50.00	$22,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	60	$100.00	$6,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
11	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	320	$60.00	$19,200.00
12	NCDOT	ASPHALT PAVEMENT (4")	TN	1,160	$140.00	$162,400.00
13	P-602	BITUMINOUS PRIME COAT	GAL	320	$3.50	$1,120.00
14	P-603	BITUMINOUS TACK COAT	GAL	500	$3.00	$1,500.00
15	P-610	CURB AND GUTTER	LF	1,650	$35.00	$57,750.00
16	P-620	PAVEMENT MARKING	SF	3,000	$2.00	$6,000.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
18	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
19	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
20		CONTINGENCY (20%)	LS	1	$6,943,600.00	$6,943,600.00
		CONSTRUCTION TOTAL				$41,661,470.00
		PREMIUM FOR WORKING UNDER TRAFFIC (15%)				$6,249,220.50
		DESIGN (8%)				$3,333,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$4,999,000.00
		PROJECT TOTAL				$56,242,690.50

PROJECT #10

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
AIR APRON BOARDING BRIDGE - (LEFT)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$160,600.00	$160,600.00
2	P-101	BOARDING BRIDGE	LS	1	$1,000,000.00	$1,000,000.00
3	P-101	TERMINAL BUILDING UPFIT COSTS	LS	1	$500,000.00	$500,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$75,000.00	$75,000.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$30,000.00	$30,000.00
6	P-620	AIRFIELD MARKING	SF	500	$2.00	$1,000.00
7		CONTINGENCY (20%)	LS	1	$353,300.00	$353,300.00
		CONSTRUCTION TOTAL				$2,119,900.00
		DESIGN (8%)				$170,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$254,000.00
		PROJECT TOTAL				$2,543,900.00

PROJECT #10

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
AIR CARRIER APRON BOARDING BRIDGE - (RIGHT)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$107,100.00	$107,100.00
2	P-101	BOARDING BRIDGE	LS	1	$1,000,000.00	$1,000,000.00
3	P-102	SAFETY AND SECURITY	LS	1	$50,000.00	$50,000.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$20,000.00	$20,000.00
5	P-620	AIRFIELD MARKING	SF	500	$2.00	$1,000.00
6		CONTINGENCY (20%)	LS	1	$235,600.00	$235,600.00
		CONSTRUCTION TOTAL				$1,413,700.00
		DESIGN (8%)				$113,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$170,000.00
		PROJECT TOTAL				$1,696,700.00

PROJECT #11

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
FUEL FARM EXPANSION - PHASE 1

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$105,900.00	$105,900.00
2	P-101	PAVEMENT REMOVAL	SY	2,000	$8.00	$16,000.00
3	P-140	FENCE REMOVAL	LF	800	$15.00	$12,000.00
4	P-140	SLIDING GATE REMOVAL	LS	1	$3,000.00	$3,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$49,500.00	$49,500.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$19,800.00	$19,800.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	2,200	$8.00	$17,600.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,600	$60.00	$96,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	1,200	$140.00	$168,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	1,600	$3.50	$5,600.00
12	P-603	BITUMINOUS TACK COAT	GAL	500	$3.00	$1,500.00
13	F-162	FENCE	LF	1,100	$55.00	$60,500.00
14	F-162	AUTOMATIC GATE WITH KEY PAD	LS	1	$20,000.00	$20,000.00
15	F-162	ACCESS CONTROL PANEL	LS	1	$15,000.00	$15,000.00
16	G-101	FUEL FARM INSTALLATION	LS	1	$520,000.00	$520,000.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
18	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
19	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
20		CONTINGENCY (20%)	LS	1	$233,000.00	$233,000.00
		CONSTRUCTION TOTAL				$1,397,800.00
		DESIGN (8%)				$112,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$168,000.00
		PROJECT TOTAL				$1,677,800.00

PROJECT #12

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
DEMOLISH TAXIWAY E AND F

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$42,000.00	$42,000.00
2	P-101	PAVEMENT REMOVAL	SY	19,000	$9.00	$171,000.00
3	P-102	SAFETY AND SECURITY	LS	1	$20,000.00	$20,000.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$8,000.00	$8,000.00
5	P-152	EMBANKMENT	CY	6,000	$15.00	$90,000.00
6	M-103	RUNWAY CLOSURE MARKERS	EA	2	$3,000.00	$6,000.00
7	L-105	REMOVAL OF TAXIWAY ELECTRICAL (CABLE, CONDUIT, LIGHTS, SIGNS, ETC)	LS	1	$60,000.00	$60,000.00
8	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$25,000.00	$25,000.00
9	T-901	SEEDING	AC	9	$1,200.00	$10,800.00
10	T-908	MULCHING	AC	9	$1,000.00	$9,000.00
11	L-110	MISCELLANEOUS ELECTRICAL FOR RUNWAY	LS	1	$20,000.00	$20,000.00
12		CONTINGENCY (20%)	LS	1	$88,400.00	$88,400.00
		CONSTRUCTION TOTAL				$550,200.00
		PREMIUM FOR NIGHT WORK (25%)				$137,550.00
		DESIGN (8%)				$44,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$66,000.00
		PROJECT TOTAL				$797,750.00

PROJECT #12

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
CLOSURE OF TAXIWAY E AND F

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$13,700.00	$13,700.00
2	P-101	PAINT REMOVAL	SY	6,000	$8.00	$48,000.00
3	P-102	SAFETY AND SECURITY	LS	1	$6,000.00	$6,000.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$3,000.00	$3,000.00
5	L-105	REMOVAL OF TAXIWAY ELECTRICAL (CABLE, CONDUIT, LIGHTS, SIGNS, ETC)	LS	1	$50,000.00	$50,000.00
6	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$5,000.00	$5,000.00
7	P-620	AIRPORT MARKING	SF	1,210	$2.00	$2,420.00
8	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
9	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
10	L-110	MISCELLANEOUS ELECTRICAL FOR RUNWAY	LS	1	$20,000.00	$20,000.00
11		CONTINGENCY (20%)	LS	1	$26,100.00	$26,100.00
		CONSTRUCTION TOTAL				$176,420.00
		PREMIUM FOR NIGHT WORK (25%)				$44,105.00
		DESIGN (8%)				$14,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$21,000.00
		PROJECT TOTAL				$255,525.00

PROJECT #14 / #19

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
WIDEN APRON EDGE AT TAXIWAY L3 AND WIDEN TAXILANE AT GA APRON (ASPHALT ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$240,100.00	$240,100.00
3	P-102	SAFETY AND SECURITY	LS	1	$112,200.00	$112,200.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$44,900.00	$44,900.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	12,000	$8.00	$96,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
7	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	6,000	$60.00	$360,000.00
8	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	4,500	$150.00	$675,000.00
9	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	5,900	$150.00	$885,000.00
10	P-602	BITUMINOUS PRIME COAT	GAL	6,500	$3.50	$22,750.00
11	P-603	BITUMINOUS TACK COAT	GAL	6,100	$3.00	$18,300.00
12	P-604	EXPANSION JOINT	LF	2,600	$3.00	$7,800.00
13	P-620	AIRFIELD MARKING	SF	800	$2.00	$1,600.00
14	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
15	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
16	L-105	ELECTRICAL DEMOLITION	LS	1	$25,000.00	$25,000.00
17	L-108	CABLE TRENCHING	LF	3,800	$2.00	$7,600.00
18	L-108	#8, 5KV, TYPE 'C' CABLE	LF	4,100	$2.00	$8,200.00
19	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	4,100	$1.85	$7,585.00
20	L-125	NEW TAXIWAY LIGHTS	EA	79	$1,500.00	$118,500.00
0		CONTINGENCY (20%)	LS	1	$528,100.00	$528,100.00
		CONSTRUCTION TOTAL				$3,168,835.00
		PREMIUM FOR NIGHT WORK (25%)				$792,000.00
		DESIGN (8%)				$254,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$380,000.00
		PROJECT TOTAL				$4,594,835.00

PROJECT #14 / #19

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
WIDEN APRON EDGE AT TAXIWAY L3 AND WIDEN TAXILANE AT GA APRON (CONCRETE ALTERNATE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$306,900.00	$306,900.00
3	P-102	SAFETY AND SECURITY	LS	1	$143,400.00	$143,400.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$57,400.00	$57,400.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	12,000	$8.00	$96,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
7	P-304	CEMENT TREATED BASE COURSE (6")	SY	20,600	$30.00	$618,000.00
8	P-501	PORTLAND CEMENT CONCRETE (11")	SY	19,600	$100.00	$1,960,000.00
9	P-604	EXPANSION JOINT	LF	5,300	$3.00	$15,900.00
10	P-620	AIRFIELD MARKING	SF	800	$2.00	$1,600.00
11	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
12	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
13	L-105	ELECTRICAL DEMOLITION	LS	1	$25,000.00	$25,000.00
14	L-108	CABLE TRENCHING	LF	3,800	$2.00	$7,600.00
15	L-108	#8, 5KV, TYPE 'C' CABLE	LF	4,100	$2.00	$8,200.00
16	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	4,100	$1.85	$7,585.00
17	L-125	NEW TAXIWAY LIGHTS	EA	79	$1,500.00	$118,500.00
0		CONTINGENCY (20%)	LS	1	$675,300.00	$675,300.00
		CONSTRUCTION TOTAL				$4,051,585.00
		PREMIUM FOR NIGHT WORK (25%)				$1,013,000.00
		DESIGN (8%)				$324,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$486,000.00
		PROJECT TOTAL				$5,874,585.00

PROJECT #15 / #20

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
AIRCRAFT APRON REHABILITATION - (RIGHT) AND CONCORSE EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$764,500.00	$764,500.00
2	P-101	PAVEMENT REMOVAL (CONCRETE)	SY	6,500	$25.00	$162,500.00
3	P-101	CONCOURSE BUILDING EXPANSION	SF	25,500	$150.00	$3,825,000.00
4	P-101	CONCOURSE BUILDING UTILITIES	SF	25,500	$10.00	$255,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$791,000.00	$791,000.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$1,582,000.00	$1,582,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$20,000.00	$20,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	6,500	$30.00	$195,000.00
9	P-501	PORTLAND CEMENT CONCRETE (17")	SY	6,500	$125.00	$812,500.00
10	P-620	AIRFIELD MARKING	SF	1,100	$2.00	$2,200.00
11		CONTINGENCY (20%)	LS	1	$1,681,900.00	$1,681,900.00
		CONSTRUCTION TOTAL				$10,091,600.00
		DESIGN (8%)				$807,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,211,000.00
		PROJECT TOTAL				$12,109,600.00

PROJECT #16 / #22

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

0-5 YEAR ENGINEERS ESTIMATE
MAINTENANCE YARD EXPANSION - PHASE 1

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$115,200.00	$115,200.00
2	P-101	BUILDING	SF	5,600	$130.00	$728,000.00
3	P-101	BUILDING UTILITIES	LS	1	$50,000.00	$50,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$53,800.00	$53,800.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$21,500.00	$21,500.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	1,100	$8.00	$8,800.00
7	P-152	ROCK EXCAVATION	CY	270	$50.00	$13,500.00
8	P-152	ROCK EXCAVATION (TRENCHING)	CY	30	$100.00	$3,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,000	$60.00	$60,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	800	$140.00	$112,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	1,000	$3.50	$3,500.00
13	P-603	BITUMINOUS TACK COAT	GAL	330	$3.00	$990.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
15	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
16	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
17		CONTINGENCY (20%)	LS	1	$253,500.00	$253,500.00
		CONSTRUCTION TOTAL				$1,520,990.00
		DESIGN (8%)				$122,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$183,000.00
		PROJECT TOTAL				$1,825,990.00

PROJECT #18 / #23

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
NEW ECONOMY PARKING LOT - PHASE 1

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$216,300.00	$216,300.00
2	P-101	PAVEMENT MILLING (2")	SY	21,600	$6.00	$129,600.00
3	P-102	SAFETY AND SECURITY	LS	1	$101,100.00	$101,100.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$40,400.00	$40,400.00
5	P-151	CLEARING AND GRUBBING	AC	3	$8,000.00	$24,000.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	2,800	$8.00	$22,400.00
7	P-152	ROCK EXCAVATION	CY	4,200	$50.00	$210,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	500	$100.00	$50,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$75,000.00	$75,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	4,700	$60.00	$282,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	6,400	$140.00	$896,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	5,100	$3.50	$17,850.00
13	P-603	BITUMINOUS TACK COAT	GAL	3,900	$3.00	$11,700.00
14	P-610	CURB AND GUTTER	LF	1,900	$35.00	$66,500.00
15	P-620	PAVEMENT MARKING	SF	2,200	$2.00	$4,400.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
17	L-110	UTILITIES	LS	1	$100,000.00	$100,000.00
18	L-110	LIGHTING	LS	1	$75,000.00	$75,000.00
19	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
20	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
21		CONTINGENCY (20%)	LS	1	$475,800.00	$475,800.00
		CONSTRUCTION TOTAL				$2,854,650.00
		DESIGN (8%)				$228,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$343,000.00
		PROJECT TOTAL				$3,425,650.00

PROJECT #21 / #27

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
ROUNDABOUT AT ENTRANCE ROAD TO TERMINAL

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$45,800.00	$45,800.00
2	P-101	PAVEMENT REMOVAL	SY	900	$6.00	$5,400.00
3	P-101	PAVEMENT MILLING (2")	SY	400	$4.00	$1,600.00
4	P-102	SAFETY AND SECURITY	LS	1	$21,400.00	$21,400.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$8,600.00	$8,600.00
6	P-151	CLEARING AND GRUBBING	AC	1	$8,000.00	$8,000.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	600	$8.00	$4,800.00
8	P-152	ROCK EXCAVATION	CY	110	$50.00	$5,500.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	610	$60.00	$36,600.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	420	$140.00	$58,800.00
12	P-602	BITUMINOUS PRIME COAT	GAL	530	$3.50	$1,855.00
13	P-603	BITUMINOUS TACK COAT	GAL	200	$3.00	$600.00
14	P-610	CURB AND GUTTER	LF	830	$35.00	$29,050.00
15	P-610	CONCRETE MEDIAN	SY	580	$35.00	$20,300.00
16	P-620	PAVEMENT MARKING	SF	700	$2.00	$1,400.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
18	L-110	UTILITY RELOCATIONS	LS	1	$100,000.00	$100,000.00
19	L-110	LIGHTING	LS	1	$75,000.00	$75,000.00
20	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
21	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
22		CONTINGENCY (20%)	LS	1	$100,800.00	$100,800.00
		CONSTRUCTION TOTAL				$604,905.00
		PREMIUM FOR WORKING UNDER TRAFFIC (15%)				$90,740.00
		DESIGN (8%)				$48,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$73,000.00
		PROJECT TOTAL				$816,645.00

PROJECT #27

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
RUNWAY 22 ALSF-II

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$363,800.00	$363,800.00
2	L-100	ALSF-II	LS	1	$2,500,000.00	$2,500,000.00
3	L-100	ALSF-II SUPPORTING FACILITIES	LS	1	$900,000.00	$900,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$170,000.00	$170,000.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$68,000.00	$68,000.00
6		CONTINGENCY (20%)	LS	1	$800,400.00	$800,400.00
		CONSTRUCTION TOTAL				$4,802,200.00
		DESIGN (8%)				$384,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$576,000.00
		PROJECT TOTAL				$5,762,200.00

PROJECT B

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
TAXIWAY INTERSECTION (TW L AND TW L4)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$98,100.00	$98,100.00
2	P-101	PAVEMENT REMOVAL	SY	2,600	$6.00	$15,600.00
3	P-102	SAFETY AND SECURITY	LS	1	$45,900.00	$45,900.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$18,300.00	$18,300.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	3,000	$8.00	$24,000.00
6	P-152	ROCK EXCAVATION	CY	500	$50.00	$25,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,300	$60.00	$138,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	1,800	$150.00	$270,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	2,300	$150.00	$345,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	2,500	$3.50	$8,750.00
12	P-603	BITUMINOUS TACK COAT	GAL	2,400	$3.00	$7,200.00
13	P-620	AIRFIELD MARKING	SF	3,300	$2.00	$6,600.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
15	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
16	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
17	L-108	CABLE TRENCHING	LF	500	$2.00	$1,000.00
18	L-108	#8, 5KV, TYPE 'C' CABLE	LF	600	$2.00	$1,200.00
19	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	600	$1.85	$1,110.00
20	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	160	$65.00	$10,400.00
21	L-125	TAXIWAY LIGHTS (LED)	EA	12	$1,500.00	$18,000.00
22	L-125	AIRFIELD GUIDANCE SIGN	EA	2	$5,000.00	$10,000.00
23		CONTINGENCY (20%)	LS	1	$215,900.00	$215,900.00
		CONSTRUCTION TOTAL				$1,295,260.00
		PREMIUM FOR NIGHT WORK (25%)				$323,815.00
		DESIGN (8%)				$104,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$155,000.00
		PROJECT TOTAL				$1,878,075.00

PROJECT #28

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

0-5 YEAR ENGINEERS ESTIMATE
GA APRON EXPANSION - PHASE 1a - DESIGN AND SITE PREP

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$70,800.00	$70,800.00
2	P-102	SAFETY AND SECURITY	LS	1	$33,100.00	$33,100.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$13,200.00	$13,200.00
4	P-151	CLEARING AND GRUBBING	AC	2	$8,000.00	$16,000.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	3,400	$8.00	$27,200.00
6	P-152	ROCK EXCAVATION	CY	9,500	$50.00	$475,000.00
7	P-152	ROCK EXCAVATION FOR TRENCHING	CY	1,100	$100.00	$110,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
9	T-901	SEEDING	AC	4	$1,200.00	$4,800.00
10	T-908	MULCHING	AC	4	$1,000.00	$4,000.00
11		CONTINGENCY (20%)	LS	1	$155,800.00	$155,800.00
		CONSTRUCTION TOTAL				$934,900.00
		PREMIUM FOR NIGHT WORK (15%)				$140,235.00
		DESIGN (8%)				$1,085,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$112,000.00
		PROJECT TOTAL				$2,272,135.00

*DESIGN COST COMES FROM ENTIRE PROJECT - SEE PHASE 2 FOR FULL SPREADSHEET

PROJECT #29

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 1 - DESIGN AND SITE PREP

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$64,100.00	$64,100.00
2	P-101	PAVEMENT REMOVAL	SY	900	$9.00	$8,100.00
3	P-102	SAFETY AND SECURITY	LS	1	$42,700.00	$42,700.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$28,500.00	$28,500.00
5	P-151	CLEARING AND GRUBBING	AC	5	$8,000.00	$40,000.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	16,000	$8.00	$128,000.00
7	P-152	ROCK EXCAVATION	CY	5,900	$50.00	$295,000.00
8	P-152	ROCK EXCAVATION (TRENCHING)	CY	850	$100.00	$85,000.00
9	T-901	SEEDING	AC	6	$1,200.00	$7,200.00
10	T-908	MULCHING	AC	6	$1,000.00	$6,000.00
11		CONTINGENCY (20%)	LS	1	$140,900.00	$140,900.00
		CONSTRUCTION TOTAL				$845,500.00
		DESIGN (8%)				$218,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$101,000.00
		PROJECT TOTAL				$1,164,500.00

*DESIGN COST COMES FROM ENTIRE PROJECT - SEE PHASE 2 FOR FULL SPREADSHEET

PROJECT #29

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 1 - DESIGN AND SITE PREP
CONCRETE ALTERNATE

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$20,700.00	$20,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$9,700.00	$9,700.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$3,900.00	$3,900.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
5	P-152	ROCK EXCAVATION	CY	2,200	$50.00	$110,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	400	$100.00	$40,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
9	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
10		CONTINGENCY (20%)	LS	1	$45,500.00	$45,500.00
		CONSTRUCTION TOTAL				$273,200.00
		DESIGN (8%)				$268,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$33,000.00
		PROJECT TOTAL				$574,200.00

PROJECT #29

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
APRON - PHASE 1 SOUTHEAST OF AIR CARRIER APRON (ASPHALT ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$20,700.00	$20,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$9,700.00	$9,700.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$3,900.00	$3,900.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
5	P-152	ROCK EXCAVATION	CY	2,200	$50.00	$110,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	400	$100.00	$40,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
9	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
10		CONTINGENCY (20%)	LS	1	$45,500.00	$45,500.00
		CONSTRUCTION TOTAL				$273,200.00
		DESIGN (8%)				$182,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$33,000.00
		PROJECT TOTAL				$488,200.00

PROJECT #29

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
HANGAR/PARKING/ROAD - PHASE 1 SOUTHEAST OF AIR CARRIER APRON

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$17,700.00	$17,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$8,300.00	$8,300.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$3,300.00	$3,300.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	7,000	$8.00	$56,000.00
5	P-152	ROCK EXCAVATION	CY	900	$50.00	$45,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	100	$100.00	$10,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
8	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
9	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
10		CONTINGENCY (20%)	LS	1	$38,900.00	$38,900.00
		CONSTRUCTION TOTAL				$233,600.00
		DESIGN (8%)				$1,198,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$28,000.00
		PROJECT TOTAL				$1,459,600.00

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
ENGINEERS ESTIMATE

	PROJECT	CONSTRUCTION	DESIGN	PROFESSIONAL SERVICES	TOTAL	
#30	CONCOURSE A EXPANSION AND FIS DEVELOPMENT - DESIGN ONLY		$617,000.00		$617,000.00	
#31	EXPAND GA APRON AND ADD 300'X100' HANGAR	$14,571,535.00	PHASE 1	$1,521,000.00	$16,092,535.00	
#32	PROPOSED TAXIWAY H (ASPHALT ALTERNATIVE)	$3,080,435.00	$197,000.00	$296,000.00	$3,573,435.00	
	PROPOSED TAXIWAY H (CONCRETE ALTERNATIVE)	$2,881,685.00	$184,000.00	$277,000.00	$3,342,685.00	*
#33	SOUTH MRO DEVLEOPMENT AREA - PHASE 1 CONSTRUCTION - TOTAL	$20,283,545.00	PHASE 1	$2,435,000.00	$22,718,545.00	
	* EXTEND TAXILANE TO SOUTHEAST OF AIR CARRIER APRON	$2,372,245.00		$285,000.00	$2,657,245.00	
	* SOUTH MRO DEVELOPMENT AREA - PHASE 1					
	APRON - (CONCRETE ALTERNATIVE)	$3,096,200.00		$372,000.00	$3,468,200.00	
	APRON - (ASPHALT ALTERNATIVE)	$2,014,150.00		$242,000.00	$2,256,150.00	*
	* HANGAR/PARKING/ROAD - PHASE 1 SOUTHEAST OF AIR CARRIER APRON	$14,815,100.00		$1,778,000.00	$16,593,100.00	
#34	TRANSIENT APRON REHABILITATION	$12,738,500.00	$815,000.00	$1,223,000.00	$14,776,500.00	
#35	AIR CARGO APRON EXPANSION - PHASE 3	$12,748,800.00	$1,020,000.00	$1,530,000.00	$15,298,800.00	
#35	AIR CARGO APRON - HANGAR AND PARKING - PHASE 3	$24,203,250.00	$1,936,000.00	$2,904,000.00	$29,043,250.00	
#36	GENERAL AVIATION APRON EXPANSION - PHASE 2	$3,874,600.00	$310,000.00	$465,000.00	$4,649,600.00	
#36	GENERAL AVIATION APRON EXPANSION - PHASE 2 (HANGAR AND PARKING)	$10,683,750.00	$855,000.00	$1,282,000.00	$12,820,750.00	
#37	AIR TRAFFIC CONTROL TOWER ROAD AND PARKING LOT	$1,089,750.00	$87,000.00	$131,000.00	$1,307,750.00	
#37	AIR TRAFFIC CONTROL TOWER AND BUILDINGS	$16,279,400.00	$651,000.00	$2,605,000.00	$19,535,400.00	
#38	TERMINAL BAGGAGE CLAIM AND TERMINAL CURB EXPANSION	$8,073,005.00	$562,000.00	$842,000.00	$9,477,005.00	
#39	CONCOURSE A RECONFIGURATION AND FIS COORIDOR - CONSTRUCTION ONLY	$7,715,290.00	PHASE 1	$926,000.00	$8,641,290.00	
#40	GSP DR. REALIGNMENT & AVIATION PKWY INTERSECTION ROUNDABOUT	$1,925,554.25	$134,000.00	$201,000.00	$2,260,554.25	
#41	NEW SURFACE ECONOMY LOT - PHASE 2	$3,554,800.00	$284,000.00	$427,000.00	$4,265,800.00	
#42	MAINTENANCE YARD EXPANSION - PHASE 2	$1,169,600.00	$94,000.00	$140,000.00	$1,403,600.00	
#43	AVIATION PARKWAY TO NORTHBOUND I-85 FLYOVER	$7,133,450.00	$496,000.00	$744,000.00	$8,373,450.00	
	TOTAL	$134,553,729.25	$7,441,000.00	$16,151,000.00	$158,145,729.25	

* NOT INCLUDED IN TOTALS

PROJECT #31

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
EXTEND GA APRON AND ADD 300'X100' HANGAR

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$959,900.00	$959,900.00
2	P-101	HANGAR BUILDING	SF	30,000	$150.00	$4,500,000.00
3	P-101	HANGAR UTILITIES	SF	30,000	$10.00	$300,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$448,600.00	$448,600.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$179,400.00	$179,400.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
7	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	300	$60.00	$18,000.00
8	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	200	$140.00	$28,000.00
9	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	300	$140.00	$42,000.00
10	P-304	CEMENT TREATED BASE COURSE	SY	19,700	$60.00	$1,182,000.00
11	P-501	PORTLAND CEMENT CONCRETE (19")	SY	16,800	$140.00	$2,352,000.00
12	P-501	REINFORCED PORTLAND CEMENT CONCRETE (19")	SY	2,800	$150.00	$420,000.00
13	P-602	BITUMINOUS PRIME COAT	GAL	300	$3.50	$1,050.00
14	P-603	BITUMINOUS TACK COAT	GAL	250	$3.00	$750.00
15	P-610	CURB AND GUTTER	LF	800	$35.00	$28,000.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
17	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
18	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
19		CONTINGENCY (20%)	LS	1	$2,111,800.00	$2,111,800.00
		CONSTRUCTION TOTAL				$12,670,900.00
		PREMIUM FOR NIGHT WORK (15%)				$1,900,635.00
		DESIGN (8%)				$1,014,000.00
		BIDDING, CA, INSPECTION, TESTING (20%)				$1,521,000.00
		PROJECT TOTAL				$16,092,535.00

*DESIGN COMPLETED IN PHASE 1 - NOT INCLUDED IN THIS TOTAL
*Design TOTAL OF $1,085,000 - When projects #29 and #31 were combined - Site prep and design in Phase 1

PROJECT #32

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
PROPOSED TAXIWAY H (ASPHALT ALTERNATE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$186,700.00	$186,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$87,200.00	$87,200.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$34,900.00	$34,900.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	5,000	$8.00	$40,000.00
5	P-152	ROCK EXCAVATION	CY	1,000	$50.00	$50,000.00
6	P-154	SUBBASE COURSE (10")	CY	2,500	$40.00	$100,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (8")	CY	3,300	$60.00	$198,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (10")	TON	4,900	$150.00	$735,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (6")	TON	3,000	$145.00	$435,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	2,700	$3.50	$9,450.00
12	P-603	BITUMINOUS TACK COAT	GAL	6,000	$3.00	$18,000.00
13	P-620	AIRFIELD MARKING	SF	6,600	$2.00	$13,200.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
15	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
16	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
17	L-108	CABLE TRENCHING	LF	2,000	$2.00	$4,000.00
18	L-108	#8, 5KV, TYPE 'C' CABLE	LF	2,100	$2.00	$4,200.00
19	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	2,100	$1.85	$3,885.00
20	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	200	$65.00	$13,000.00
21	L-125	TAXIWAY LIGHTS (LED)	EA	44	$1,500.00	$66,000.00
22	L-125	AIRFIELD GUIDANCE SIGN	EA	4	$5,000.00	$20,000.00
23		CONTINGENCY (20%)	LS	1	$410,700.00	$410,700.00
		CONSTRUCTION TOTAL				$2,464,435.00
		PREMIUM FOR NIGHT WORK (25%)				$616,000.00
		DESIGN (8%)				$197,000.00
		BIDDING, CA, INSPECTION, TESTING (20%)				$296,000.00
		PROJECT TOTAL				$3,573,435.00

PROJECT #32

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
PROPOSED TAXIWAY H (CONCRETE ALTERNATE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$174,700.00	$174,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$81,600.00	$81,600.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$32,600.00	$32,600.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	5,000	$8.00	$40,000.00
5	P-152	ROCK EXCAVATION	CY	1,000	$50.00	$50,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
7	P-304	CEMENT TREATED BASE COURSE (6")	SY	8,300	$30.00	$249,000.00
8	P-501	PORTLAND CEMENT CONCRETE (19")	SY	8,100	$140.00	$1,134,000.00
9	P-620	AIRFIELD MARKING	SF	6,600	$2.00	$13,200.00
10	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
11	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
12	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
13	L-108	CABLE TRENCHING	LF	2,000	$2.00	$4,000.00
14	L-108	#8, 5KV, TYPE 'C' CABLE	LF	2,100	$2.00	$4,200.00
15	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	2,100	$1.85	$3,885.00
16	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	200	$65.00	$13,000.00
17	L-125	TAXIWAY LIGHTS (LED)	EA	44	$1,500.00	$66,000.00
18	L-125	AIRFIELD GUIDANCE SIGN	EA	4	$5,000.00	$20,000.00
19		CONTINGENCY (20%)	LS	1	$384,300.00	$384,300.00
		CONSTRUCTION TOTAL				$2,305,685.00
		PREMIUM FOR NIGHT WORK (25%)				$576,000.00
		DESIGN (8%)				$184,000.00
		BIDDING, CA, INSPECTION, TESTING (20%)				$277,000.00
		PROJECT TOTAL				$3,342,685.00

PROJECTA1:G40 #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
EXTEND TAXILANE SOUTHEAST OF AIR CARRIER APRON

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$179,700.00	$179,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$84,000.00	$84,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$33,600.00	$33,600.00
4	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
5	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	4,400	$60.00	$264,000.00
6	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	3,300	$150.00	$495,000.00
7	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	4,400	$150.00	$660,000.00
8	P-602	BITUMINOUS PRIME COAT	GAL	4,300	$3.50	$15,050.00
9	P-603	BITUMINOUS TACK COAT	GAL	4,100	$3.00	$12,300.00
10	P-620	AIRFIELD MARKING	SF	4,800	$2.00	$9,600.00
11	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
12	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
13	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
14	L-108	CABLE TRENCHING	LF	4,000	$2.00	$8,000.00
15	L-108	#8, 5KV, TYPE 'C' CABLE	LF	4,700	$2.00	$9,400.00
16	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	4,700	$1.85	$8,695.00
17	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	220	$65.00	$14,300.00
18	L-125	TAXIWAY LIGHTS (LED)	EA	44	$1,500.00	$66,000.00
19	L-125	AIRFIELD GUIDANCE SIGN	EA	4	$5,000.00	$20,000.00
20		CONTINGENCY (20%)	LS	1	$395,400.00	$395,400.00
		CONSTRUCTION TOTAL				$2,372,245.00
		DESIGN (8%)				$190,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$285,000.00
		PROJECT TOTAL				$2,847,245.00

*DESIGN COMPLETED IN PHASE 1 - NOT INCLUDED IN THIS TOTAL
Design TOTAL OF $218,000 - When projects #30 and #33 were combined - Site prep and design in Phase 1

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
APRON - PHASE 1 SOUTHEAST OF AIR CARRIER APRON (CONCRETE ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$234,600.00	$234,600.00
2	P-102	SAFETY AND SECURITY	LS	1	$109,600.00	$109,600.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$43,800.00	$43,800.00
4	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
5	P-304	CEMENT TREATED BASE COURSE (6")	SY	13,000	$60.00	$780,000.00
6	P-501	PORTLAND CEMENT CONCRETE (12")	SY	13,000	$100.00	$1,300,000.00
7	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
8	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
9	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
10		CONTINGENCY (20%)	LS	1	$516,000.00	$516,000.00
		CONSTRUCTION TOTAL				$3,096,200.00
		DESIGN (8%)				$248,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$372,000.00
		PROJECT TOTAL				$3,468,200.00

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
APRON - PHASE 1 SOUTHEAST OF AIR CARRIER APRON (ASPHALT ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$152,600.00	$152,600.00
2	P-102	SAFETY AND SECURITY	LS	1	$71,300.00	$71,300.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$28,500.00	$28,500.00
4	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
5	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	3,700	$60.00	$222,000.00
6	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	3,000	$150.00	$450,000.00
7	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	3,800	$150.00	$570,000.00
8	P-602	BITUMINOUS PRIME COAT	GAL	4,000	$3.50	$14,000.00
9	P-603	BITUMINOUS TACK COAT	GAL	4,000	$3.00	$12,000.00
10	P-608	SEAL COAT	SY	13,100	$3.50	$45,850.00
11	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
12	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
13	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
14		CONTINGENCY (20%)	LS	1	$335,700.00	$335,700.00
		CONSTRUCTION TOTAL				$2,014,150.00
		DESIGN (8%)				$161,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$242,000.00
		PROJECT TOTAL				$2,256,150.00

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
HANGAR/PARKING/ROAD - PHASE 1 SOUTHEAST OF AIR CARRIER APRON

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,122,400.00	$1,122,400.00
2	P-101	HANGAR BUILDING	SF	73,000	$125.00	$9,125,000.00
3	P-101	HANGAR UTILITIES	SF	73,000	$10.00	$730,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$524,500.00	$524,500.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$209,800.00	$209,800.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
7	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,700	$60.00	$162,000.00
8	NCDOT	ASPHALT PAVEMENT (4")	TN	2,200	$140.00	$308,000.00
9	P-602	BITUMINOUS PRIME COAT	GAL	2,600	$3.50	$9,100.00
10	P-603	BITUMINOUS TACK COAT	GAL	900	$3.00	$2,700.00
11	P-610	CURB AND GUTTER	LF	800	$35.00	$28,000.00
12	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
13	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
14	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
15		CONTINGENCY (20%)	LS	1	$2,469,200.00	$2,469,200.00
		CONSTRUCTION TOTAL				$14,815,100.00
		DESIGN (8%)				$1,185,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,778,000.00
		PROJECT TOTAL				$16,593,100.00

PROJECT #34

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
TRANSIENT APRON REHABILITATION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$772,000.00	$772,000.00
2	P-101	PAVEMENT REMOVAL	SY	23,400	$25.00	$585,000.00
3	P-102	SAFETY AND SECURITY	LS	1	$360,800.00	$360,800.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$144,300.00	$144,300.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	3,400	$8.00	$27,200.00
6	P-152	ROCK EXCAVATION	CY	3,100	$50.00	$155,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	34,800	$60.00	$2,088,000.00
9	P-501	PORTLAND CEMENT CONCRETE (17")	SY	34,800	$125.00	$4,350,000.00
10		CONTINGENCY (20%)	LS	1	$1,698,500.00	$1,698,500.00
		CONSTRUCTION TOTAL				$10,190,800.00
		PREMIUM FOR NIGHT WORK (25%)				$2,547,700.00
		DESIGN, BIDDING, CA, INSPECTION, TESTING (8%)				$815,000.00
		DESIGN, BIDDING, CA, INSPECTION, TESTING (12%)				$1,223,000.00
		PROJECT TOTAL				$14,776,500.00

PROJECT #35

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
CARGO APRON EXPANSION - PHASE 2

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$965,800.00	$965,800.00
2	P-102	SAFETY AND SECURITY	LS	1	$451,300.00	$451,300.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$180,500.00	$180,500.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	15,900	$8.00	$127,200.00
5	P-152	ROCK EXCAVATION	CY	15,500	$50.00	$775,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	1,700	$100.00	$170,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	45,600	$30.00	$1,368,000.00
9	P-501	PORTLAND CONCRETE CEMENT (19")	SY	45,600	$140.00	$6,384,000.00
10	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
11	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
12	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
13		CONTINGENCY (20%)	LS	1	$2,124,800.00	$2,124,800.00
		CONSTRUCTION TOTAL				$12,748,800.00
		DESIGN (8%)				$1,020,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,530,000.00
		PROJECT TOTAL				$15,298,800.00

PROJECT #35

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
CARGO APRON - PHASE 2 - HANGAR AND PARKING

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,833,600.00	$1,833,600.00
2	P-101	HANGAR BUILDING	SF	125,000	$130.00	$16,250,000.00
3	P-101	HANGAR UTILITIES	LS	1	$50,000.00	$50,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$856,800.00	$856,800.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$342,700.00	$342,700.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	10,100	$8.00	$80,800.00
7	P-152	ROCK EXCAVATION	CY	600	$50.00	$30,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	100	$100.00	$10,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	3,300	$60.00	$198,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	2,700	$140.00	$378,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	3,200	$3.50	$11,200.00
13	P-603	BITUMINOUS TACK COAT	GAL	1,100	$3.00	$3,300.00
14	P-610	CURB AND GUTTER	LF	650	$35.00	$22,750.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
16	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
17	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
18		CONTINGENCY (20%)	LS	1	$4,033,900.00	$4,033,900.00
		CONSTRUCTION TOTAL				$24,203,250.00
		DESIGN (8%)				$1,936,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$2,904,000.00
		PROJECT TOTAL				$29,043,250.00

PROJECT #36

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
GENERAL AVIATION APRON EXPANSION - PHASE 2

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$293,500.00	$293,500.00
2	P-102	SAFETY AND SECURITY	LS	1	$137,200.00	$137,200.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$54,900.00	$54,900.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	6,500	$8.00	$52,000.00
5	P-152	ROCK EXCAVATION	CY	2,900	$50.00	$145,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	330	$100.00	$33,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	18,700	$30.00	$561,000.00
9	P-501	PORTLAND CONCRETE CEMENT (12")	SY	18,500	$100.00	$1,850,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$645,800.00	$645,800.00
		CONSTRUCTION TOTAL				$3,874,600.00
		DESIGN (8%)				$310,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$465,000.00
		PROJECT TOTAL				$4,649,600.00

PROJECT #36

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
GENERAL AVIATION APRON EXPANSION - PHASE 2 - HANGAR AND PARKING

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$809,400.00	$809,400.00
2	P-101	HANGAR BUILDING (100'x170')	SF	17,000	$130.00	$2,210,000.00
3	P-101	HANGAR UTILITIES (100'x170')	LS	1	$100,000.00	$100,000.00
4	P-101	HANGAR BUILDING (125'x300')	SF	37,500	$130.00	$4,875,000.00
5	P-101	HANGAR UTILITIES (125'x300')	LS	1	$100,000.00	$100,000.00
6	P-102	SAFETY AND SECURITY	LS	1	$378,200.00	$378,200.00
7	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$151,300.00	$151,300.00
8	P-152	UNCLASSIFIED EXCAVATION	CY	600	$8.00	$4,800.00
9	P-152	ROCK EXCAVATION	CY	120	$50.00	$6,000.00
10	P-152	ROCK EXCAVATION FOR TRENCHING	CY	100	$100.00	$10,000.00
11	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
12	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	600	$60.00	$36,000.00
13	NCDOT	ASPHALT PAVEMENT (4")	TN	350	$140.00	$49,000.00
14	P-602	BITUMINOUS PRIME COAT	GAL	600	$3.50	$2,100.00
15	P-603	BITUMINOUS TACK COAT	GAL	200	$3.00	$600.00
16	P-610	CURB AND GUTTER	LF	530	$35.00	$18,550.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
18	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
19	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
20		CONTINGENCY (20%)	LS	1	$1,780,600.00	$1,780,600.00
		CONSTRUCTION TOTAL				$10,683,750.00
		DESIGN (8%)				$855,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,282,000.00
		PROJECT TOTAL				$12,820,750.00

PROJECT #37

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
AIR TRAFFIC CONTROL TOWER ROAD AND PARKING LOT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$82,600.00	$82,600.00
2	P-102	SAFETY AND SECURITY	LS	1	$38,600.00	$38,600.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$15,400.00	$15,400.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	2,900	$8.00	$23,200.00
5	P-152	ROCK EXCAVATION	CY	900	$50.00	$45,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	100	$100.00	$10,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
8	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,100	$60.00	$126,000.00
9	NCDOT	ASPHALT PAVEMENT (4")	TN	1,600	$140.00	$224,000.00
10	P-602	BITUMINOUS PRIME COAT	GAL	2,100	$3.50	$7,350.00
11	P-603	BITUMINOUS TACK COAT	GAL	700	$3.00	$2,100.00
12	P-610	CURB AND GUTTER	LF	3,700	$35.00	$129,500.00
13	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
14	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
15	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
16		CONTINGENCY (20%)	LS	1	$181,600.00	$181,600.00
		CONSTRUCTION TOTAL				$1,089,750.00
		DESIGN (8%)				$87,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$131,000.00
		PROJECT TOTAL				$1,307,750.00

PROJECT #37

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
AIR TRAFFIC CONTROL TOWER AND BUILDINGS

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,233,300.00	$1,233,300.00
2	P-101	AIR TRAFFIC CONTROL TOWER OFFICES	SF	12,000	$150.00	$1,800,000.00
3	P-101	AIR TRAFFIC CONTROL TOWER OFFICES UTILIITIES	SF	12,000	$50.00	$600,000.00
4	P-101	AIR TRAFFIC CONTROL TOWER	LS	1	$5,700,000.00	$5,700,000.00
5	P-101	AIR TRAFFIC CONTROL TOWER EQUIPMENT	LS	1	$1,500,000.00	$1,500,000.00
6	P-101	AVIATION SUPPORT OFFICES	SF	12,000	$30.00	$360,000.00
7	P-101	AVIATION SUPPORT OFFICES UTILIITES	SF	12,000	$115.00	$1,380,000.00
8	P-102	SAFETY AND SECURITY	LS	1	$576,300.00	$576,300.00
9	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$230,500.00	$230,500.00
10	P-152	UNCLASSIFIED EXCAVATION	CY	4,000	$8.00	$32,000.00
11	P-152	ROCK EXCAVATION	CY	450	$50.00	$22,500.00
12	P-152	ROCK EXCAVATION FOR TRENCHING	CY	50	$100.00	$5,000.00
13	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
15	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
16	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
17		CONTINGENCY (20%)	LS	1	$2,713,200.00	$2,713,200.00
		CONSTRUCTION TOTAL				$16,279,400.00
		DESIGN (4%)				$651,000.00
		BIDDING, CA, INSPECTION, TESTING (12%))				$2,605,000.00
		PROJECT TOTAL				$19,535,400.00

PROJECT #38

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
TERMINAL BAGGAGE CLAIM AND TERMINAL CURB EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$531,800.00	$531,800.00
2	P-101	CONCOURSE EXPANSION	SF	31,180	$130.00	$4,053,400.00
3	P-101	CONCOURSE EXPANSION UTILITIES	LS	1	$100,000.00	$100,000.00
4	P-101	PAVMENT REMOVAL	SY	7,200	$6.00	$43,200.00
5	P-102	SAFETY AND SECURITY	LS	1	$248,500.00	$248,500.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$99,400.00	$99,400.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$75,000.00	$75,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,860	$60.00	$111,600.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	1,500	$140.00	$210,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	1,830	$3.50	$6,405.00
12	P-603	BITUMINOUS TACK COAT	GAL	600	$3.00	$1,800.00
13	P-610	CURB AND GUTTER	LF	1,660	$35.00	$58,100.00
14	P-620	PAVEMENT MARKING	SF	1,200	$2.00	$2,400.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
16	L-110	UTILITY RELOCATIONS	LS	1	$100,000.00	$100,000.00
17	L-110	LIGHTING	LS	1	$75,000.00	$75,000.00
18	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
19	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
20		CONTINGENCY (20%)	LS	1	$1,170,000.00	$1,170,000.00
		CONSTRUCTION TOTAL				$7,020,005.00
		PREMIUM FOR WORKING UNDER TRAFFIC (15%)				$1,053,000.00
		DESIGN (8%)				$562,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$842,000.00
		PROJECT TOTAL				$9,477,005.00

PROJECT #39

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
CONCOURSE A RECONFIGURATION AND FIS COORIDOR

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$585,500.00	$585,500.00
2	P-101	PAVEMENT REMOVAL (CONCRETE)	SY	2,300	$25.00	$57,500.00
3	-	CONCOURSE A EXPANSION	SF	17,600	$200.00	$3,520,000.00
4	-	AIRLINE GSE BUILDING	SF	14,400	$120.00	$1,728,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$274,000.00	$274,000.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$109,000.00	$109,000.00
7	P-151	CLEARING AND GRUBBING	AC	1	$8,000.00	$8,000.00
8	P-152	UNCLASSIFIED EXCAVATION	CY	200	$8.00	$1,600.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$20,000.00	$20,000.00
10	P-304	CEMENT TREATED BASE COURSE (6")	SY	400	$30.00	$12,000.00
11	P-501	PORTLAND CEMENT CONCRETE (19")	SY	400	$140.00	$56,000.00
12	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
13	F-162	FENCE REMOVAL	LF	240	$6.00	$1,440.00
14	F-162	CHAINLINK FENCE	LF	350	$45.00	$15,750.00
15	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
16	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
17		CONTINGENCY (20%)	LS	1	$1,274,300.00	$1,274,300.00
		CONSTRUCTION TOTAL				$7,715,290.00
		DESIGN (8%)				$617,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$926,000.00
		PROJECT TOTAL				$8,641,290.00

PROJECT #40

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
GSP DRIVE REALIGNMENT & AVIATION PKWY INTERSECTION ROUNDABOUT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$126,800.00	$126,800.00
2	P-101	PAVEMENT REMOVAL	SY	800	$6.00	$4,800.00
3	P-101	PAVMENT MILLING	SY	1,100	$4.00	$4,400.00
4	P-102	SAFETY AND SECURITY	LS	1	$59,300.00	$59,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$23,700.00	$23,700.00
6	P-151	CLEARING AND GRUBBING	AC	2	$8,000.00	$16,000.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	2,800	$8.00	$22,400.00
8	P-152	ROCK EXCAVATION	CY	900	$50.00	$45,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	100	$100.00	$10,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
11	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,790	$60.00	$167,400.00
12	NCDOT	ASPHALT PAVEMENT (4")	TN	2,110	$140.00	$295,400.00
13	P-602	BITUMINOUS PRIME COAT	GAL	2,670	$3.50	$9,345.00
14	P-603	BITUMINOUS TACK COAT	GAL	800	$3.00	$2,400.00
15	P-610	CURB AND GUTTER	LF	3,290	$35.00	$115,150.00
16	P-620	PAVEMENT MARKING	SF	5,800	$2.00	$11,600.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$75,000.00	$75,000.00
18	L-110	UTILITY RELOCATIONS	LS	1	$175,000.00	$175,000.00
19	L-110	LIGHTING	LS	1	$125,000.00	$125,000.00
20	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
21	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
22		CONTINGENCY (20%)	LS	1	$279,100.00	$279,100.00
		CONSTRUCTION TOTAL				$1,674,395.00
		PREMIUM FOR WORKING UNDER TRAFFIC (15%)				$251,159.25
		DESIGN (8%)				$134,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$201,000.00
		PROJECT TOTAL				$2,260,554.25

PROJECT #41

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
PARKING LOT EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$269,300.00	$269,300.00
2	P-102	SAFETY AND SECURITY	LS	1	$125,800.00	$125,800.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$50,300.00	$50,300.00
4	P-151	CLEARING AND GRUBBING	AC	20	$8,000.00	$160,000.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	10,000	$8.00	$80,000.00
6	P-152	ROCK EXCAVATION	CY	1,400	$50.00	$70,000.00
7	P-152	ROCK EXCAVATION (TRENCHING)	CY	160	$100.00	$16,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	7,900	$60.00	$474,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	6,500	$140.00	$910,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	7,800	$3.50	$27,300.00
12	P-603	BITUMINOUS TACK COAT	GAL	2,600	$3.00	$7,800.00
13	P-610	CURB AND GUTTER	LF	3,600	$35.00	$126,000.00
14	P-620	PAVEMENT MARKING	SF	13,400	$2.00	$26,800.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$125,000.00	$125,000.00
16	F-162	ACCESS CONTROL SYSTEM	LS	1	$200,000.00	$200,000.00
17	L-110	PARKING LOT LIGHTING	LS	1	$200,000.00	$200,000.00
18	T-901	SEEDING	AC	20	$1,200.00	$24,000.00
19	T-908	MULCHING	AC	20	$1,000.00	$20,000.00
20		CONTINGENCY (20%)	LS	1	$592,500.00	$592,500.00
		CONSTRUCTION TOTAL				$3,554,800.00
		DESIGN (8%)				$284,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$427,000.00
		PROJECT TOTAL				$4,265,800.00

PROJECT #42

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

6-10 YEAR ENGINEERS ESTIMATE
MAINTENANCE OFFICE AREA EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$88,600.00	$88,600.00
2	P-101	BUILDING	SF	4,550	$130.00	$591,500.00
3	P-101	BUILDING UTILITIES	LS	1	$40,000.00	$40,000.00
4	P-101	PAVEMENT REMOVAL	SY	300	$6.00	$1,800.00
5	P-102	SAFETY AND SECURITY	LS	1	$41,400.00	$41,400.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$16,600.00	$16,600.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	900	$8.00	$7,200.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	500	$60.00	$30,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	400	$140.00	$56,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	500	$3.50	$1,750.00
12	P-603	BITUMINOUS TACK COAT	GAL	150	$3.00	$450.00
13	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
14	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
15	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
16		CONTINGENCY (20%)	LS	1	$194,900.00	$194,900.00
		CONSTRUCTION TOTAL				$1,169,600.00
		DESIGN (8%)				$94,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$140,000.00

PROJECT #43

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
AVIATION PARKWAY TO NORTHBOUND 1-85 FLYOVER

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$469,900.00	$469,900.00
2	P-101	PAVEMENT MILLING (2")	SY	23,000	$6.00	$138,000.00
3	P-101	BRIDGE	LS	1	$2,500,000.00	$2,500,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$810,200.00	$810,200.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$648,200.00	$648,200.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
7	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,700	$60.00	$162,000.00
8	NCDOT	ASPHALT PAVEMENT (2")	TN	2,700	$140.00	$378,000.00
9	P-603	BITUMINOUS TACK COAT	GAL	2,100	$3.00	$6,300.00
10	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
11	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
12		CONTINGENCY (20%)	LS	1	$1,033,800.00	$1,033,800.00
		CONSTRUCTION TOTAL				$6,203,000.00
		PREMIUM FOR WORKING UNDER TRAFFIC (15%)				$930,450.00
		DESIGN (8%)				$496,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$744,000.00
		PROJECT TOTAL				$8,373,450.00

PROJECT #31

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
EXTEND GA APRON AND ADD 300'X100' HANGAR

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,027,000.00	$1,027,000.00
2	P-101	HANGAR BUILDING	SF	30,000	$150.00	$4,500,000.00
3	P-101	HANGAR UTILITIES	SF	30,000	$10.00	$300,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$479,200.00	$479,200.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$191,700.00	$191,700.00
6	P-151	CLEARING AND GRUBBING	AC	2	$8,000.00	$16,000.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	3,400	$8.00	$27,200.00
8	P-152	ROCK EXCAVATION	CY	9,500	$50.00	$475,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	1,100	$100.00	$110,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
11	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	300	$60.00	$18,000.00
12	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	200	$140.00	$28,000.00
13	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	300	$140.00	$42,000.00
14	P-304	CEMENT TREATED BASE COURSE	SY	19,700	$60.00	$1,182,000.00
15	P-501	PORTLAND CEMENT CONCRETE (19")	SY	16,800	$140.00	$2,352,000.00
16	P-501	REINFORCED PORTLAND CEMENT CONCRETE (19")	SY	2,800	$150.00	$420,000.00
17	P-602	BITUMINOUS PRIME COAT	GAL	300	$3.50	$1,050.00
18	P-603	BITUMINOUS TACK COAT	GAL	250	$3.00	$750.00
19	P-610	CURB AND GUTTER	LF	800	$35.00	$28,000.00
20	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
21	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
22	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
23		CONTINGENCY (20%)	LS	1	$2,259,500.00	$2,259,500.00
		CONSTRUCTION TOTAL				$13,556,800.00
		PREMIUM FOR NIGHT WORK (15%)				$2,033,520.00
		DESIGN (8%)				$1,085,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,627,000.00
		PROJECT TOTAL				$18,302,320.00

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
EXTEND TAXILANE SOUTHEAST OF AIR CARRIER APRON

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$206,900.00	$206,900.00
2	P-101	PAVEMENT REMOVAL	SY	900	$9.00	$8,100.00
3	P-102	SAFETY AND SECURITY	LS	1	$96,700.00	$96,700.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$38,700.00	$38,700.00
5	P-151	CLEARING AND GRUBBING	AC	5	$8,000.00	$40,000.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	5,000	$8.00	$40,000.00
7	P-152	ROCK EXCAVATION	CY	2,700	$50.00	$135,000.00
8	P-152	ROCK EXCAVATION (TRENCHING)	CY	310	$100.00	$31,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
10	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	4,400	$60.00	$264,000.00
11	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	3,300	$150.00	$495,000.00
12	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	4,400	$150.00	$660,000.00
13	P-602	BITUMINOUS PRIME COAT	GAL	4,300	$3.50	$15,050.00
14	P-603	BITUMINOUS TACK COAT	GAL	4,100	$3.00	$12,300.00
15	P-620	AIRFIELD MARKING	SF	4,800	$2.00	$9,600.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
17	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
18	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
19	L-108	CABLE TRENCHING	LF	4,000	$2.00	$8,000.00
20	L-108	#8, 5KV, TYPE 'C' CABLE	LF	4,700	$2.00	$9,400.00
21	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	4,700	$1.85	$8,695.00
22	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	220	$65.00	$14,300.00
23	L-125	TAXIWAY LIGHTS (LED)	EA	44	$1,500.00	$66,000.00
24	L-125	AIRFIELD GUIDANCE SIGN	EA	4	$5,000.00	$20,000.00
25		CONTINGENCY (20%)	LS	1	$455,200.00	$455,200.00
		CONSTRUCTION TOTAL				$2,731,145.00
		DESIGN (8%)				$218,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$328,000.00
		PROJECT TOTAL				$3,277,145.00

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
APRON - PHASE 1 SOUTHEAST OF AIR CARRIER APRON (CONCRETE ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$254,000.00	$254,000.00
2	P-102	SAFETY AND SECURITY	LS	1	$118,700.00	$118,700.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$47,500.00	$47,500.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
5	P-152	ROCK EXCAVATION	CY	2,200	$50.00	$110,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	400	$100.00	$40,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	13,000	$60.00	$780,000.00
9	P-501	PORTLAND CEMENT CONCRETE (12")	SY	13,000	$100.00	$1,300,000.00
10	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
11	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
12	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
13		CONTINGENCY (20%)	LS	1	$558,700.00	$558,700.00
		CONSTRUCTION TOTAL				$3,352,300.00
		DESIGN (8%)				$268,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$402,000.00
		PROJECT TOTAL				$4,022,300.00

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
APRON - PHASE 1 SOUTHEAST OF AIR CARRIER APRON (ASPHALT ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$172,000.00	$172,000.00
2	P-102	SAFETY AND SECURITY	LS	1	$80,400.00	$80,400.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$32,100.00	$32,100.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
5	P-152	ROCK EXCAVATION	CY	2,200	$50.00	$110,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	400	$100.00	$40,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	3,700	$60.00	$222,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	3,000	$150.00	$450,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	3,800	$150.00	$570,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	4,000	$3.50	$14,000.00
12	P-603	BITUMINOUS TACK COAT	GAL	4,000	$3.00	$12,000.00
13	P-608	SEAL COAT	SY	13,100	$3.50	$45,850.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
15	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
16	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
17		CONTINGENCY (20%)	LS	1	$378,400.00	$378,400.00
		CONSTRUCTION TOTAL				$2,270,150.00
		DESIGN (8%)				$182,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$272,000.00
		PROJECT TOTAL				$2,724,150.00

PROJECT #33

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

6-10 YEAR ENGINEERS ESTIMATE
HANGAR/PARKING/ROAD - PHASE 1 SOUTHEAST OF AIR CARRIER APRON

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,134,200.00	$1,134,200.00
2	P-101	HANGAR BUILDING	SF	73,000	$125.00	$9,125,000.00
3	P-101	HANGAR UTILITIES	SF	73,000	$10.00	$730,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$530,000.00	$530,000.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$212,000.00	$212,000.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	7,000	$8.00	$56,000.00
7	P-152	ROCK EXCAVATION	CY	900	$50.00	$45,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	100	$100.00	$10,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,700	$60.00	$162,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	2,200	$140.00	$308,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	2,600	$3.50	$9,100.00
13	P-603	BITUMINOUS TACK COAT	GAL	900	$3.00	$2,700.00
14	P-610	CURB AND GUTTER	LF	800	$35.00	$28,000.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
16	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
17	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
18		CONTINGENCY (20%)	LS	1	$2,495,300.00	$2,495,300.00
		CONSTRUCTION TOTAL				$14,971,700.00
		DESIGN (8%)				$1,198,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,797,000.00
		PROJECT TOTAL				$17,966,700.00

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
ENGINEERS ESTIMATE

	PROJECT	CONSTRUCTION	DESIGN SERVICES	PROFESSIONAL SERVICES	TOTAL	
#44	SOUTH MRO DEVELOPMENT AREA - PHASE 2 TOTALS	$18,061,400.00	$1,445,000.00	$2,182,000.00	$21,688,400.00	
	SOUTH MRO DEVELOPMENT AREA - PHASE 2 (ASPHALT APRON ALTERNATIVE)	$2,203,100.00	$176,000.00	$264,000.00	$2,643,100.00	*
	SOUTH MRO DEVELOPMENT AREA - PHASE 2 (CONCRETE APRON ALTERNATIVE)	$3,302,800.00	$264,000.00	$396,000.00	$3,962,800.00	
	SOUTH MRO DEVELOPMENT AREA - PHASE 2 (HANGAR/PARKING/ROAD)	$14,758,600.00	$1,181,000.00	$1,771,000.00	$17,710,600.00	
#45	TAXIWAY L9 REALIGNMENT	$7,348,730.00	$470,000.00	$720,000.00	$8,538,730.00	
#46	AIR CARGO APRON AND BUILDING EXPANSION - PHASE 4 TOTALS	$36,816,300.00	$2,945,000.00	$4,448,000.00	$44,209,300.00	
	AIR CARGO APRON AND BUILDING EXPANSION - PHASE 4 (APRON)	$7,400,600.00	$592,000.00	$888,000.00	$8,880,600.00	
	AIR CARGO APRON AND BUILDING EXPANSION - PHASE 4 (HANGAR AND PARKING)	$29,415,700.00	$2,353,000.00	$3,530,000.00	$35,298,700.00	
#47	GA APRON EXPANSION - PHASE 3 TOTALS	$32,288,640.00	$2,583,000.00	$3,904,000.00	$38,775,640.00	
	GA APRON EXPANSION - PHASE 3 (HANGAR, PARKING AND ROAD)	$7,516,280.00	$601,000.00	$902,000.00	$9,019,280.00	
	GA APRON EXPANSION - PHASE 3 (WITH HANGAR)	$11,167,700.00	$893,000.00	$1,340,000.00	$13,400,700.00	
	GA APRON EXPANSION - PHASE 3 (HANGAR AND PARKING - LEFT SIDE)	$6,009,795.00	$481,000.00	$721,000.00	$7,211,795.00	
	GA APRON EXPANSION - PHASE 3 (HANGAR AND PARKING - BOTTOM SIDE)	$7,594,865.00	$608,000.00	$911,000.00	$9,113,865.00	
#48	CONCOURSE B BUILDOUT AND APRON EXPANSION	$15,404,500.00	$1,479,000.00	$1,486,500.00	$18,370,000.00	
#49	MAINTENANCE OFFICE EXPANSION WITH PARKING LOT	$995,550.00	$80,000.00	$126,500.00	$1,202,050.00	
#50	AIRPORT FUEL FARM EXPANSION - PHASE 2	$876,580.00	$70,000.00	$112,500.00	$1,059,080.00	
#51	SOUTH MRO DEVELOPMENT AREA - PHASE 3 TOTALS	$18,539,900.00	$1,483,000.00	$2,240,000.00	$22,262,900.00	
	SOUTH MRO DEVELOPMENT AREA - PHASE 3 (ASPHALT APRON ALTERNATIVE)	$2,000,800.00	$160,000.00	$240,000.00	$2,400,800.00	*
	SOUTH MRO DEVELOPMENT AREA - PHASE 3 (CONCRETE APRON ALTERNATIVE)	$2,993,300.00	$239,000.00	$359,000.00	$3,591,300.00	
	SOUTH MRO DEVELOPMENT AREA - PHASE 3 (HANGAR/PARKING/ROAD)	$15,546,600.00	$1,244,000.00	$1,866,000.00	$18,656,600.00	
	TOTAL	$130,331,600.00	$10,555,000.00	$15,219,500.00	$156,106,100.00	

* NOT INCLUDED IN TOTALS

* ENVIRONMENTAL COSTS ARE ROUGH APPROXIMATES - IT IS UNKNOWN IF A CATEX IS SUFFICIENT OR A FULL EA IS NEEDED

PROJECT #44

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

11-20 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 2 (ASPHALT APRON ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$166,900.00	$166,900.00
2	P-102	SAFETY AND SECURITY	LS	1	$78,000.00	$78,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$31,200.00	$31,200.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
5	P-152	ROCK EXCAVATION	CY	3,300	$50.00	$165,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	440	$100.00	$44,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	3,700	$60.00	$222,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	3,000	$150.00	$450,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	3,800	$150.00	$570,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	3,600	$3.50	$12,600.00
12	P-603	BITUMINOUS TACK COAT	GAL	3,600	$3.00	$10,800.00
13	P-608	SEAL COAT	SY	12,000	$3.50	$42,000.00
14	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
15	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
16		CONTINGENCY (20%)	LS	1	$367,200.00	$367,200.00
		CONSTRUCTION TOTAL				$2,203,100.00
		DESIGN (8%)				$176,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$264,000.00
		PROJECT TOTAL				$2,643,100.00

PROJECT #44

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

11-20 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 2 (CONCRETE APRON ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$250,200.00	$250,200.00
2	P-102	SAFETY AND SECURITY	LS	1	$116,900.00	$116,900.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$46,800.00	$46,800.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,900	$8.00	$31,200.00
5	P-152	ROCK EXCAVATION	CY	3,300	$50.00	$165,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	440	$100.00	$44,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	13,100	$60.00	$786,000.00
9	P-501	PORTLAND CEMENT CONCRETE (12")	SY	13,000	$100.00	$1,300,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$550,500.00	$550,500.00
		CONSTRUCTION TOTAL				$3,302,800.00
		DESIGN (8%)				$264,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$396,000.00
		PROJECT TOTAL				$3,962,800.00

PROJECT #44

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 2 (HANGAR/PARKING/ROAD)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,118,100.00	$1,118,100.00
2	P-101	HANGAR BUILDING	SF	73,000	$130.00	$9,490,000.00
3	P-101	HANGAR UTILITIES	LS	1	$25,000.00	$25,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$522,500.00	$522,500.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$209,000.00	$209,000.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	3,000	$8.00	$24,000.00
7	P-152	ROCK EXCAVATION	CY	6,700	$50.00	$335,000.00
8	P-152	ROCK EXCAVATION (TRENCHING)	CY	70	$100.00	$7,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,500	$60.00	$150,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	2,000	$140.00	$280,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	2,400	$3.50	$8,400.00
13	P-603	BITUMINOUS TACK COAT	GAL	800	$3.00	$2,400.00
14	P-610	CURB AND GUTTER	LF	800	$35.00	$28,000.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
16	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
17	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
18		CONTINGENCY (20%)	LS	1	$2,459,800.00	$2,459,800.00
		CONSTRUCTION TOTAL				$14,758,600.00
		DESIGN (8%)				$1,181,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,771,000.00
		PROJECT TOTAL				$17,710,600.00

PROJECT #45

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
TAXIWAY L9 REALIGNMENT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$445,400.00	$445,400.00
2	P-101	PAVEMENT REMOVAL (ASPHALT)	SY	4,300	$9.00	$38,700.00
3	P-101	PAVEMENT REMOVAL (CONCRETE)	SY	3,000	$20.00	$60,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$208,100.00	$208,100.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$83,200.00	$83,200.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	900	$8.00	$7,200.00
7	P-152	ROCK EXCAVATION	CY	2,600	$50.00	$130,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	300	$100.00	$30,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$8,000.00	$8,000.00
10	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,700	$60.00	$102,000.00
11	P-304	CEMENT TREATED BASE COURSE (6")	SY	6,600	$30.00	$198,000.00
12	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	1,300	$140.00	$182,000.00
13	P-501	PORTLAND CEMENT CONCRETE (19")	SY	6,400	$140.00	$896,000.00
14	P-602	BITUMINOUS PRIME COAT	GAL	1,900	$3.50	$6,650.00
15	P-603	BITUMINOUS TACK COAT	GAL	600	$3.00	$1,800.00
16	P-620	AIRFIELD MARKING	SF	10,700	$1.50	$16,050.00
17	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
18	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
19	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
20	L-105	ELECTRICAL DEMOLITION	LS	1	$25,000.00	$25,000.00
21	L-108	CABLE TRENCHING	LF	1,600	$2.00	$3,200.00
22	L-108	#8, 5KV, TYPE 'C' CABLE	LF	1,800	$2.00	$3,600.00
23	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	1,800	$1.85	$3,330.00
24	L-110	2 WAY 2" SCH 40 PVC CONCRETE ENCASED	LF	250	$50.00	$12,500.00
25	L-110	2" SCH 40 PVC CONDUIT DIRECT BURIED	EA	1,600	$5.00	$8,000.00
26	L-125	AIRFIELD GUIDANCE SIGN	EA	2	$4,000.00	$8,000.00
27	L-125	NEW TAXIWAY LIGHTS	EA	1,600	$1,500.00	$2,400,000.00
28		CONTINGENCY (20%)	LS	1	$979,800.00	$979,800.00
		CONSTRUCTION TOTAL				$5,878,730.00
		PREMIUM FOR NIGHT WORK (25%)				$1,470,000.00
		DESIGN (8%)				$470,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$705,000.00
		PROJECT TOTAL				$8,523,730.00

PROJECT #46

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
AIR CARGO APRON AND BUILDING EXPANSION - PHASE 4 (APRON)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$560,700.00	$560,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$27,300.00	$27,300.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$109,400.00	$109,400.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	4,700	$8.00	$37,600.00
5	P-152	ROCK EXCAVATION	CY	13,400	$50.00	$670,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	1,500	$100.00	$150,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$20,000.00	$20,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	27,000	$30.00	$810,000.00
9	P-501	PORTLAND CEMENT CONCRETE (19")	SY	27,000	$140.00	$3,780,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$1,233,400.00	$1,233,400.00
		CONSTRUCTION TOTAL				$7,400,600.00
		DESIGN (8%)				$592,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$888,000.00
		PROJECT TOTAL				$8,880,600.00

PROJECT #46

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
AIR CARGO APRON AND BUILDING EXPANSION - PHASE 4 (HANGAR AND PARKING)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,228,500.00	$2,228,500.00
2	P-101	HANGAR BUILDING	SF	150,000	$130.00	$19,500,000.00
3	P-101	HANGAR UTILITIES	LS	1	$100,000.00	$100,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$1,041,300.00	$1,041,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$416,500.00	$416,500.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	5,300	$8.00	$42,400.00
7	P-152	ROCK EXCAVATION	CY	6,000	$50.00	$300,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	700	$100.00	$70,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	3,900	$60.00	$234,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	3,200	$140.00	$448,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	3,800	$3.50	$13,300.00
13	P-603	BITUMINOUS TACK COAT	GAL	1,300	$3.00	$3,900.00
14	P-610	CURB AND GUTTER	LF	1,800	$35.00	$63,000.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
16	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
17	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
18		CONTINGENCY (20%)	LS	1	$4,902,600.00	$4,902,600.00
		CONSTRUCTION TOTAL				$29,415,700.00
		DESIGN (8%)				$2,353,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$3,530,000.00
		PROJECT TOTAL				$35,298,700.00

PROJECT #47

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
GA APRON EXPANSION - PHASE 3 (HANGAR, PARKING AND ROAD)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$569,400.00	$569,400.00
2	P-101	CONCRETE PAVEMENT REMOVAL	SY	2,150	$20.00	$43,000.00
3	P-101	HANGAR BUILDING (160'x110')	SF	37,500	$130.00	$4,875,000.00
4	P-101	HANGAR UTILITIES (160'x110')	LS	1	$100,000.00	$100,000.00
5	P-101	HANGAR MODIFICATION (SWITCHING DOOR SIDES)	EA	2	$15,000.00	$30,000.00
6	P-102	SAFETY AND SECURITY	LS	1	$266,100.00	$266,100.00
7	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$106,400.00	$106,400.00
8	P-152	EMBANKMENT	CY	1,080	$25.00	$27,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	700	$60.00	$42,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	530	$150.00	$79,500.00
12	P-602	BITUMINOUS PRIME COAT	GAL	700	$3.50	$2,450.00
13	P-603	BITUMINOUS TACK COAT	GAL	210	$3.00	$630.00
14	P-610	CURB AND GUTTER	LF	1,140	$35.00	$39,900.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
16	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
17	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
18		CONTINGENCY (20%)	LS	1	$1,252,700.00	$1,252,700.00
		CONSTRUCTION TOTAL				$7,516,280.00
		DESIGN (8%)				$601,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$902,000.00
		PROJECT TOTAL				$9,019,280.00

PROJECT #47

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

10-20 YEAR ENGINEERS ESTIMATE
GA APRON EXPANSION - PHASE 3 (WITH HANGAR)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$846,000.00	$846,000.00
2	P-101	HANGAR BUILDING (160'x110')	SF	37,500	$130.00	$4,875,000.00
3	P-101	HANGAR UTILITIES (160'x110')	LS	1	$100,000.00	$100,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$41,300.00	$41,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$165,100.00	$165,100.00
6	P-151	CLEARING AND GRUBBING	AC	5	$5,000.00	$25,000.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	7,000	$8.00	$56,000.00
8	P-152	ROCK EXCAVATION	CY	5,700	$50.00	$285,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	630	$100.00	$63,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
11	P-304	CEMENT TREATED BASE COURSE (6")	SY	16,800	$30.00	$504,000.00
12	P-501	PORTLAND CEMENT CONCRETE (19")	SY	16,500	$140.00	$2,310,000.00
13	T-901	SEEDING	AC	5	$1,200.00	$6,000.00
14	T-908	MULCHING	AC	5	$1,000.00	$5,000.00
15		CONTINGENCY (20%)	LS	1	$1,861,300.00	$1,861,300.00
		CONSTRUCTION TOTAL				$11,167,700.00
		DESIGN (8%)				$893,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,340,000.00
		PROJECT TOTAL				$13,400,700.00

PROJECT #47

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

10-20 YEAR ENGINEERS ESTIMATE
GA APRON EXPANSION - PHASE 3 (HANGAR AND PARKING - LEFT SIDE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$455,300.00	$455,300.00
2	P-101	HANGAR BUILDING (175'x175')	SF	30,625	$130.00	$3,981,250.00
3	P-101	HANGAR UTILITIES (175'x175')	LS	1	$100,000.00	$100,000.00
4	P-151	CLEARING AND GRUBBING	AC	2	$50,000.00	$100,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$22,200.00	$22,200.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$88,800.00	$88,800.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	900	$8.00	$7,200.00
8	P-152	ROCK EXCAVATION	CY	840	$50.00	$42,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	90	$100.00	$9,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
11	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	430	$60.00	$25,800.00
12	NCDOT	ASPHALT PAVEMENT (4")	TN	340	$140.00	$47,600.00
13	P-602	BITUMINOUS PRIME COAT	GAL	430	$3.50	$1,505.00
14	P-603	BITUMINOUS TACK COAT	GAL	130	$3.00	$390.00
15	P-610	CURB AND GUTTER	LF	650	$35.00	$22,750.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
17	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
18	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
19		CONTINGENCY (20%)	LS	1	$1,001,600.00	$1,001,600.00
		CONSTRUCTION TOTAL				$6,009,795.00
		DESIGN (8%)				$481,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$721,000.00
		PROJECT TOTAL				$7,211,795.00

PROJECT #47

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

10-20 YEAR ENGINEERS ESTIMATE
GA APRON EXPANSION - PHASE 3 (HANGAR AND PARKING - BOTTOM SIDE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$575,400.00	$575,400.00
2	P-101	HANGAR BUILDING (175'x175')	SF	37,500	$130.00	$4,875,000.00
3	P-101	HANGAR UTILITIES (175'x175')	LS	1	$100,000.00	$100,000.00
4	P-151	CLEARING AND GRUBBING	AC	2	$50,000.00	$100,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$268,900.00	$268,900.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$107,500.00	$107,500.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	1,110	$8.00	$8,880.00
8	P-152	ROCK EXCAVATION	CY	1,050	$50.00	$52,500.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	120	$100.00	$12,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
11	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	580	$60.00	$34,800.00
12	NCDOT	ASPHALT PAVEMENT (4")	TN	460	$140.00	$64,400.00
13	P-602	BITUMINOUS PRIME COAT	GAL	570	$3.50	$1,995.00
14	P-603	BITUMINOUS TACK COAT	GAL	180	$3.00	$540.00
15	P-610	CURB AND GUTTER	LF	650	$35.00	$22,750.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
17	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
18	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
19		CONTINGENCY (20%)	LS	1	$1,265,800.00	$1,265,800.00
		CONSTRUCTION TOTAL				$7,594,865.00
		DESIGN (8%)				$608,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$911,000.00
		PROJECT TOTAL				$9,113,865.00

PROJECT #48

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
CONCOURSE B BUILDOUT AND APRON EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$933,600.00	$933,600.00
2	P-101	BUILDING DEMOLITION	SF	11,700	$20.00	$234,000.00
3	P-101	PAVEMENT REMOVAL	SY	24,800	$6.00	$148,800.00
4	P-102	SAFETY AND SECURITY	LS	1	$436,300.00	$436,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$174,500.00	$174,500.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	5,500	$8.00	$44,000.00
7	P-152	ROCK EXCAVATION	CY	13,700	$50.00	$685,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
9	P-304	CEMENT TREATED BASE COURSE (6")	SY	41,100	$60.00	$2,466,000.00
10	P-501	PORTLAND CEMENT CONCRETE (17")	SY	41,100	$125.00	$5,137,500.00
11		CONTINGENCY (20%)	LS	1	$2,053,900.00	$2,053,900.00
		CONSTRUCTION TOTAL				$12,323,600.00
		PREMIUM FOR NIGHT WORK (25%)				$3,080,900.00
		DESIGN (8%)				$986,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,479,000.00
		PROJECT TOTAL				$17,869,500.00

PROJECT #49

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
MAINTENANCE OFFICE EXPANSION WITH PARKING LOT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$75,400.00	$75,400.00
2	P-101	BUILDING	SF	4,550	$130.00	$591,500.00
3	P-101	BUILDING UTILITIES	LS	1	$40,000.00	$40,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$35,200.00	$35,200.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$14,100.00	$14,100.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
7	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	260	$60.00	$15,600.00
8	NCDOT	ASPHALT PAVEMENT (4")	TN	210	$140.00	$29,400.00
9	P-602	BITUMINOUS PRIME COAT	GAL	280	$3.50	$980.00
10	P-603	BITUMINOUS TACK COAT	GAL	90	$3.00	$270.00
11	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
12	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
13		CONTINGENCY (20%)	LS	1	$165,900.00	$165,900.00
		CONSTRUCTION TOTAL				$995,550.00
		DESIGN (8%)				$80,000.00
		DESIGN, BIDDING, CA, INSPECTION, TESTING (12%)				$119,000.00
		PROJECT TOTAL				$1,194,550.00

PROJECT #50

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
AIRPORT FUEL FARM EXPANSION - PHASE 2

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$66,400.00	$66,400.00
2	P-101	PAVEMENT REMOVAL	SY	330	$6.00	$1,980.00
3	P-140	FENCE REMOVAL	LF	460	$15.00	$6,900.00
4	P-102	SAFETY AND SECURITY	LS	1	$31,000.00	$31,000.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$12,400.00	$12,400.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	1,000	$8.00	$8,000.00
7	P-152	ROCK EXCAVATION	CY	500	$50.00	$25,000.00
8	P-152	ROCK EXCAVATION FOR TRENCHING	CY	60	$100.00	$6,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,200	$60.00	$72,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	900	$140.00	$126,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	1,100	$3.50	$3,850.00
13	P-603	BITUMINOUS TACK COAT	GAL	400	$3.00	$1,200.00
14	F-162	FENCE	LF	370	$55.00	$20,350.00
15	F-162	AUTOMATIC GATE WITH KEY PAD	LS	1	$20,000.00	$20,000.00
16	F-162	ACCESS CONTROL PANEL	LS	1	$15,000.00	$15,000.00
17	G-101	FUEL FARM INSTALLATION	LS	1	$260,000.00	$260,000.00
18	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
19	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
20	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
21		CONTINGENCY (20%)	LS	1	$146,100.00	$146,100.00
		CONSTRUCTION TOTAL				$876,580.00
		DESIGN (8%)				$70,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$105,000.00
		PROJECT TOTAL				$1,051,580.00

PROJECT #51

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 3 (ASPHALT APRON ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$151,600.00	$151,600.00
2	P-102	SAFETY AND SECURITY	LS	1	$70,800.00	$70,800.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$28,300.00	$28,300.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	1,000	$8.00	$8,000.00
5	P-152	ROCK EXCAVATION	CY	5,200	$50.00	$260,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	520	$100.00	$52,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	3,300	$60.00	$198,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	2,600	$140.00	$364,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	3,300	$140.00	$462,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	3,200	$3.50	$11,200.00
12	P-603	BITUMINOUS TACK COAT	GAL	3,100	$3.00	$9,300.00
13	P-608	SEAL COAT	SY	11,400	$3.50	$39,900.00
14	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
15	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
16		CONTINGENCY (20%)	LS	1	$333,500.00	$333,500.00
		CONSTRUCTION TOTAL				$2,000,800.00
		DESIGN (8%)				$160,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$240,000.00
		PROJECT TOTAL				$2,400,800.00

PROJECT #51

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
APRON - PHASE 3 SOUTHEAST OF AIR CARRIER APRON (CONCRETE ALTERNATIVE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$226,800.00	$226,800.00
2	P-102	SAFETY AND SECURITY	LS	1	$106,000.00	$106,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$42,400.00	$42,400.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	1,000	$8.00	$8,000.00
5	P-152	ROCK EXCAVATION	CY	4,300	$50.00	$215,000.00
6	P-152	ROCK EXCAVATION (TRENCHING)	CY	480	$100.00	$48,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	11,600	$60.00	$696,000.00
9	P-501	PORTLAND CEMENT CONCRETE (12")	SY	11,400	$100.00	$1,140,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$498,900.00	$498,900.00
		CONSTRUCTION TOTAL				$2,993,300.00
		DESIGN (8%)				$239,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$359,000.00
		PROJECT TOTAL				$3,591,300.00

PROJECT #51

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

11-20 YEAR ENGINEERS ESTIMATE
SOUTH MRO DEVELOPMENT AREA - PHASE 3 (HANGAR/PARKING/ROAD)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,177,800.00	$1,177,800.00
2	P-101	HANGAR BUILDING	SF	73,000	$130.00	$9,490,000.00
3	P-101	HANGAR UTILITIES	LS	1	$25,000.00	$25,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$550,400.00	$550,400.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$220,100.00	$220,100.00
6	P-152	UNCLASSIFIED EXCAVATION	CY	1,500	$8.00	$12,000.00
7	P-152	ROCK EXCAVATION	CY	3,800	$50.00	$190,000.00
8	P-152	ROCK EXCAVATION (TRENCHING)	CY	420	$100.00	$42,000.00
9	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
10	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,500	$60.00	$150,000.00
11	NCDOT	ASPHALT PAVEMENT (4")	TN	2,000	$140.00	$280,000.00
12	P-602	BITUMINOUS PRIME COAT	GAL	2,400	$3.50	$8,400.00
13	P-603	BITUMINOUS TACK COAT	GAL	800	$3.00	$2,400.00
14	P-610	CURB AND GUTTER	LF	800	$35.00	$28,000.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$750,000.00	$750,000.00
16	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
17	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
18		CONTINGENCY (20%)	LS	1	$2,591,100.00	$2,591,100.00
		CONSTRUCTION TOTAL				$15,546,600.00
		DESIGN (8%)				$1,244,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,866,000.00
		PROJECT TOTAL				$18,656,600.00

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
ENGINEERS ESTIMATE

	PROJECT	CONSTRUCTION	DESIGN SERVICES	PROFESSIONAL SERVICES	TOTAL
1	PROPOSED RUNWAY 4R-22L	$27,069,130.00	$2,166,000.00	$3,248,000.00	$32,483,130.00
2	PROPOSED PARALLEL TAXIWAY AND CONNECTORS	$31,795,065.00	$2,544,000.00	$3,815,000.00	$38,154,065.00
3	PROPOSED TAXIWAY L4	$14,619,921.25	$1,017,000.00	$1,526,000.00	$17,162,921.25
	COMBINED PROJECT 1,2 AND 3 (RUNWAY, PARALLEL TW/CONNECTORS, TW L4)	$71,786,270.00	$5,743,000.00	$8,614,000.00	$86,143,270.00
4	NEW AIRPORT LONG TERM PARKING LOT	$5,544,500.00	$444,000.00	$665,000.00	$6,653,500.00
5	APRON EXPANSION (LEFT SIDE) AND TERMINAL EXPANSION	$42,878,250.00	$2,744,000.00	$4,116,000.00	$49,738,250.00
6	APRON EXPANSION (RIGHT SIDE)	$11,446,500.00	$733,000.00	$1,099,000.00	$13,278,500.00
7	HANGARS AND PARKING LOT ON TOP SIDE OF APRON EXPANSION (RIGHT)	$11,237,485.00	$899,000.00	$1,348,000.00	$13,484,485.00
8	HANGARS AND PARKING LOT ON BOTTOM SIDE OF APRON EXPANSION (RIGHT)	$13,048,560.00	$1,044,000.00	$1,566,000.00	$15,658,560.00
9	CARGO APRON EXPANSION AND CONNECTOR TAXIWAYS - PHASE 4	$67,782,000.00	$4,338,000.00	$6,507,000.00	$78,627,000.00
10	CARGO APRON - HANGARS, PARKING LOTS AND ROADS - PHASE 4	$66,523,550.00	$5,322,000.00	$7,983,000.00	$79,828,550.00
11	PROPOSED CARGO TAXIWAY NORTHWEST OF RUNWAY	$37,365,644.75	$2,599,000.00	$3,899,000.00	$43,863,644.75
12	LARGE CARGO APRON NORTHWEST OF RUNWAY - PHASE 4	$29,809,100.00	$2,385,000.00	$3,577,000.00	$35,771,100.00
13	SMALL CARGO APRON NORTHWEST OF RUNWAY - PHASE 4	$8,740,800.00	$699,000.00	$1,049,000.00	$10,488,800.00
14	NORTHWEST CARGO APRON - 3 HANGARS, PARKING LOTS AND ROADS - PHASE 4	$64,514,000.00	$5,161,000.00	$7,742,000.00	$77,417,000.00
15	NORTHWEST CARGO APRON - HANGARS, PARKING LOT AND ROAD - PHASE 4 LEFT TOP	$42,499,650.00	$3,400,000.00	$5,100,000.00	$50,999,650.00
16	AVIATION SUPPORT BUILDINGS, PARKING LOT AND ROAD	$12,775,790.00	$1,022,000.00	$1,533,000.00	$15,330,790.00
17	FUEL FARM EXPANSION	$1,864,700.00	$149,000.00	$224,000.00	$2,237,700.00
18	NORTHWEST CARGO APRON - HANGAR, PARKING LOT AND ROAD - PHASE 4 RIGHT	$33,232,700.00	$2,659,000.00	$3,988,000.00	$39,879,700.00
19	SMALL CARGO APRON NORTHWEST OF RUNWAY - PHASE 4 - HANGAR AND PARKING LOT	$20,291,500.00	$1,623,000.00	$2,435,000.00	$24,349,500.00
20	ENTRANCE ROAD TO TERMINAL, ROAD TO AND FROM GENERAL AVIATION	$6,385,140.00	$511,000.00	$766,000.00	$7,662,140.00
21	CARGO APRON EXPANSION -NORTHEAST	$16,912,600.00	$1,353,000.00	$2,030,000.00	$20,295,600.00
22	CARGO APRON - NORTHEAST (LEFT SIDE) - HANGAR AND PARKING	$10,564,850.00	$845,000.00	$1,268,000.00	$12,677,850.00
23	CARGO APRON - NORTHEAST (RIGHT SIDE) - HANGAR AND PARKING	$7,685,420.00	$615,000.00	$922,000.00	$9,222,420.00
24	ROAD TO FUEL FARM, CARGO APRON AND LOGISTICS PARK	$2,387,440.00	$191,000.00	$286,000.00	$2,864,440.00
25	FUEL FARM EXPANSION - NEAR LOGISTICS PARK	$2,723,000.00	$218,000.00	$327,000.00	$3,268,000.00
	TOTAL	$589,697,296.00	$44,681,000.00	$67,019,000.00	$701,397,296.00

PROJECT 1

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
PROPOSED RUNWAY 4R-22L

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,056,700.00	$2,056,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$961,000.00	$961,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$384,000.00	$384,000.00
4	P-151	CLEARING AND GRUBBING	AC	80	$8,000.00	$640,000.00
5	P-152	EMBANKMENT IN PLACE (ON-SITE)	CY	147,500	$8.00	$1,180,000.00
6	P-153	EMBANKMENT IN PLACE (OFF-SITE)	CY	211,000	$16.00	$3,376,000.00
7	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$125,000.00	$125,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	36,600	$60.00	$2,196,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	29,500	$150.00	$4,425,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	37,400	$150.00	$5,610,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	35,500	$3.50	$124,250.00
12	P-603	BITUMINOUS TACK COAT	GAL	23,300	$3.00	$69,900.00
13	P-620	AIRFIELD MARKING	SF	111,000	$2.00	$222,000.00
14	P-621	RUNWAY GROOVING	SY	106,000	$4.00	$424,000.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$300,000.00	$300,000.00
16	T-901	SEEDING	AC	60	$1,200.00	$72,000.00
17	T-908	MULCHING	AC	60	$1,000.00	$60,000.00
18	L-108	CABLE TRENCHING	LF	14,200	$2.00	$28,400.00
19	L-108	#8, 5KV, TYPE 'C' CABLE	LF	16,800	$2.00	$33,600.00
20	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	16,800	$1.85	$31,080.00
21	L-110	2 WAY 2" SCH 40 PVC CONCRETE ENCASED	LF	980	$50.00	$49,000.00
22	L-110	2" SCH 40 PVC CONDUIT DIRECT BURIED	EA	14,200	$5.00	$71,000.00
23	L-125	RUNWAY LIGHTS (LED)	EA	70	$1,500.00	$105,000.00
24	L-125	RUNWAY END LIGHTS	EA	16	$2,000.00	$32,000.00
25	L-125	AIRFIELD GUIDANCE SIGN	EA	12	$4,000.00	$48,000.00
26		CONTINGENCY (20%)	LS	1	$4,445,200.00	$4,445,200.00
		CONSTRUCTION TOTAL				$27,069,130.00
		DESIGN (8%)				$2,166,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$3,248,000.00
		PROJECT TOTAL				$30,317,130.00

PROJECT 2

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
PROPOSED PARALLEL TAXIWAY AND CONNECTORS

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,420,100.00	$2,420,100.00
2	P-102	SAFETY AND SECURITY	LS	1	$1,131,000.00	$1,131,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$452,000.00	$452,000.00
4	P-151	CLEARING AND GRUBBING	AC	80	$8,000.00	$640,000.00
5	P-152	EMBANKMENT IN PLACE (OFF SITE)	CY	703,000	$16.00	$11,248,000.00
6	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$125,000.00	$125,000.00
7	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	28,200	$60.00	$1,692,000.00
8	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	22,400	$150.00	$3,360,000.00
9	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	28,600	$150.00	$4,290,000.00
10	P-602	BITUMINOUS PRIME COAT	GAL	27,700	$3.50	$96,950.00
11	P-603	BITUMINOUS TACK COAT	GAL	26,900	$3.00	$80,700.00
12	P-620	AIRFIELD MARKING	SF	27,000	$2.00	$54,000.00
13	D-701	MISCELLANEOUS DRAINAGE	LS	1	$150,000.00	$150,000.00
14	T-901	SEEDING	AC	60	$1,200.00	$72,000.00
15	T-908	MULCHING	AC	60	$1,000.00	$60,000.00
16	L-108	CABLE TRENCHING	LF	16,300	$2.00	$32,600.00
17	L-108	#8, 5KV, TYPE 'C' CABLE	LF	21,900	$2.00	$43,800.00
18	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	21,900	$1.85	$40,515.00
19	L-110	2 WAY 2" SCH 40 PVC CONCRETE ENCASED	LF	570	$50.00	$28,500.00
20	L-110	2" SCH 40 PVC CONDUIT DIRECT BURIED	EA	16,300	$5.00	$81,500.00
21	L-125	TAXIWAY LIGHTS (LED)	EA	332	$1,500.00	$498,000.00
22	L-125	AIRFIELD GUIDANCE SIGN	EA	6	$4,000.00	$24,000.00
23		CONTINGENCY (20%)	LS	1	$5,174,400.00	$5,174,400.00
		CONSTRUCTION TOTAL				$31,795,065.00
		DESIGN (8%)				$2,544,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$3,815,000.00
		PROJECT TOTAL				$35,610,065.00

PROJECT 3

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
PROPOSED TAXIWAY L4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$967,400.00	$967,400.00
2	P-102	SAFETY AND SECURITY	LS	1	$452,000.00	$452,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$181,000.00	$181,000.00
4	P-152	EMBANKMENT IN PLACE (OFF-SITE)	CY	342,000	$16.00	$5,472,000.00
5	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$100,000.00	$100,000.00
6	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	9,300	$60.00	$558,000.00
7	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	7,200	$150.00	$1,080,000.00
8	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	9,300	$150.00	$1,395,000.00
9	P-602	BITUMINOUS PRIME COAT	GAL	9,100	$3.50	$31,850.00
10	P-603	BITUMINOUS TACK COAT	GAL	8,700	$3.00	$26,100.00
11	P-620	AIRFIELD MARKING	SF	2,300	$2.00	$4,600.00
12	D-701	MISCELLANEOUS DRAINAGE	LS	1	$75,000.00	$75,000.00
13	T-901	SEEDING	AC	6	$1,200.00	$7,200.00
14	T-908	MULCHING	AC	6	$1,000.00	$6,000.00
15	L-108	CABLE TRENCHING	LF	6,700	$2.00	$13,400.00
16	L-108	#8, 5KV, TYPE 'C' CABLE	LF	8,500	$2.00	$17,000.00
17	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	8,500	$1.85	$15,725.00
18	L-110	2 WAY 2" SCH 40 PVC CONCRETE ENCASED	LF	180	$50.00	$9,000.00
19	L-110	2" SCH 40 PVC CONDUIT DIRECT BURIED	EA	6,700	$5.00	$33,500.00
20	L-125	TAXIWAY LIGHTS (LED)	EA	126	$1,500.00	$189,000.00
21	L-125	AIRFIELD GUIDANCE SIGN	EA	2	$4,000.00	$8,000.00
22		CONTINGENCY (20%)	LS	1	$2,071,200.00	$2,071,200.00
		CONSTRUCTION TOTAL				$12,712,975.00
		PREMIUM FOR NIGHT WORK (SAFETY AREA) (15%)				$1,906,946.25
		DESIGN (8%)				$1,017,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,526,000.00
		PROJECT TOTAL				$16,145,921.25

COMBINED PROJECTS 1, 2 AND 3

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
PROPOSED RUNWAY 4R-22L

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$5,460,000.00	$5,460,000.00
2	P-102	SAFETY AND SECURITY	LS	1	$2,551,000.00	$2,551,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$1,021,000.00	$1,021,000.00
4	P-151	CLEARING AND GRUBBING	AC	170	$8,000.00	$1,360,000.00
5	P-152	EMBANKMENT IN PLACE (ON-SITE)	CY	155,000	$8.00	$1,240,000.00
6	P-152	EMBANKMENT IN PLACE (OFF-SITE)	CY	1,256,000	$16.00	$20,096,000.00
7	P-156	MISCELLANEOUS EROSION CONTROL	LS	1	$350,000.00	$350,000.00
8	P-209	CRUSHED AGGREGATE BASE COURSE (10")	CY	74,100	$60.00	$4,446,000.00
9	P-401	HOT MIX ASPHALT (HMA) PAVEMENT (4")	TON	59,100	$150.00	$8,865,000.00
10	P-403	HOT MIX ASPHALT (HMA) PAVEMENT - BASE (5")	TON	75,300	$150.00	$11,295,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	72,300	$3.50	$253,050.00
12	P-603	BITUMINOUS TACK COAT	GAL	59,000	$3.00	$177,000.00
13	P-620	AIRFIELD MARKING	SF	140,000	$2.00	$280,000.00
14	P-621	RUNWAY GROOVING	SY	106,000	$4.00	$424,000.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$525,000.00	$525,000.00
16	T-901	SEEDING	AC	130	$1,200.00	$156,000.00
17	T-908	MULCHING	AC	130	$1,000.00	$130,000.00
18	L-108	CABLE TRENCHING	LF	37,100	$2.00	$74,200.00
19	L-108	#8, 5KV, TYPE 'C' CABLE	LF	47,200	$2.00	$94,400.00
20	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	47,200	$1.85	$87,320.00
21	L-110	2 WAY 2" SCH 40 PVC CONCRETE ENCASED	LF	1,720	$50.00	$86,000.00
22	L-110	2" SCH 40 PVC CONDUIT DIRECT BURIED	EA	37,100	$5.00	$185,500.00
23	L-125	TAXIWAY LIGHTS (LED)	EA	458	$1,500.00	$687,000.00
24	L-125	RUNWAY LIGHTS (LED)	EA	70	$1,500.00	$105,000.00
25	L-125	RUNWAY END LIGHTS	EA	16	$2,000.00	$32,000.00
26	L-125	AIRFIELD GUIDANCE SIGN	EA	20	$4,000.00	$80,000.00
27		CONTINGENCY (20%)	LS	1	$11,725,800.00	$11,725,800.00
		CONSTRUCTION TOTAL				$71,786,270.00
		DESIGN (8%)				$5,743,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$8,614,000.00
		PROJECT TOTAL				$80,400,270.00

PROJECT 4

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
NEW AIRPORT LONG TERM PARKING LOT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$420,000.00	$420,000.00
2	P-102	SAFETY AND SECURITY	LS	1	$196,300.00	$196,300.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$78,500.00	$78,500.00
4	P-151	CLEARING AND GRUBBING	AC	11	$8,000.00	$88,000.00
5	P-152	EMBANKMENT IN PLACE	CY	79,000	$10.00	$790,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
7	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	12,200	$60.00	$732,000.00
8	NCDOT	ASPHALT PAVEMENT (4")	TN	10,000	$140.00	$1,400,000.00
9	P-602	BITUMINOUS PRIME COAT	GAL	12,000	$3.50	$42,000.00
10	P-603	BITUMINOUS TACK COAT	GAL	4,000	$3.00	$12,000.00
11	P-610	CURB AND GUTTER	LF	3,000	$35.00	$105,000.00
12	P-620	PAVEMENT MARKING	LS	1	$200,000.00	$200,000.00
13	D-701	MISCELLANEOUS DRAINAGE	LS	1	$200,000.00	$200,000.00
14	L-110	MISCELLANEOUS ELECTRICAL - LIGHTING	LS	1	$300,000.00	$300,000.00
15	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
16	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
17		CONTINGENCY (20%)	LS	1	$924,100.00	$924,100.00
		CONSTRUCTION TOTAL				$5,544,500.00
		DESIGN (8%)				$444,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$665,000.00
		PROJECT TOTAL				$6,209,500.00

PROJECT 5

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
APRON EXPANSION (LEFT SIDE) AND TERMINAL EXPANSION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,598,700.00	$2,598,700.00
2	P-101	TERMINAL BUILDING EXPANSION	SF	104,400	$130.00	$13,572,000.00
3	P-101	TERMINAL BUILDING UTILITIES	LS	1	$250,000.00	$250,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$1,214,300.00	$1,214,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$485,700.00	$485,700.00
6	P-152	EMBANKMENT	CY	418,300	$8.00	$3,346,400.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	41,800	$30.00	$1,254,000.00
9	P-501	PORTLAND CEMENT CONCRETE (19")	SY	41,500	$140.00	$5,810,000.00
10	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
11	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
12	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
13		CONTINGENCY (20%)	LS	1	$5,717,100.00	$5,717,100.00
		CONSTRUCTION TOTAL				$34,302,600.00
		PREMIUM FOR NIGHT WORK (25%)				$8,575,650.00
		DESIGN (8%)				$2,744,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$4,116,000.00
		PROJECT TOTAL				$46,994,250.00

PROJECT 6

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
APRON EXPANSION (RIGHT SIDE)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$693,700.00	$693,700.00
2	P-102	SAFETY AND SECURITY	LS	1	$324,200.00	$324,200.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$129,700.00	$129,700.00
4	P-151	CLEARING AND GRUBBING	AC	6	$8,000.00	$48,000.00
5	P-152	EMBANKMENT	CY	235,500	$8.00	$1,884,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
7	P-304	CEMENT TREATED BASE COURSE (6")	SY	26,700	$30.00	$801,000.00
8	P-501	PORTLAND CONCRETE CEMENT (19")	SY	26,400	$140.00	$3,696,000.00
9	D-701	MISCELLANEOUS DRAINAGE	LS	1	$25,000.00	$25,000.00
10	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
11	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
12		CONTINGENCY (20%)	LS	1	$1,526,200.00	$1,526,200.00
		CONSTRUCTION TOTAL				$9,157,200.00
		PREMIUM FOR NIGHT WORK (25%)				$2,289,300.00
		DESIGN (8%)				$733,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,099,000.00
		PROJECT TOTAL				$12,545,500.00

PROJECT 7

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
HANGARS AND PARKING LOT ON TOP SIDE OF APRON EXPANSION (RIGHT)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$851,300.00	$851,300.00
2	P-101	HANGAR BUILDING (300X125)	SF	37,500	$130.00	$4,875,000.00
3	P-101	HANGAR UTILITIES (300X125)	LS	1	$100,000.00	$100,000.00
4	P-102	HANGAR BUILDING (150X125)	SF	18,750	$130.00	$2,437,500.00
5	P-103	HANGAR UTILITIES (150X125)	LS	1	$100,000.00	$100,000.00
6	P-102	SAFETY AND SECURITY	LS	1	$397,800.00	$397,800.00
7	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$159,000.00	$159,000.00
8	P-151	CLEARING AND GRUBBING	AC	3	$8,000.00	$24,000.00
9	P-152	UNCLASSIFIED EXCAVATION	CY	1,700	$8.00	$13,600.00
10	P-152	ROCK EXCAVATION	CY	1,700	$50.00	$85,000.00
11	P-152	ROCK EXCAVATION (TRENCHING)	CY	190	$100.00	$19,000.00
12	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
13	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	900	$60.00	$54,000.00
14	NCDOT	ASPHALT PAVEMENT (4")	TN	730	$140.00	$102,200.00
15	P-602	BITUMINOUS PRIME COAT	GAL	910	$3.50	$3,185.00
16	P-603	BITUMINOUS TACK COAT	GAL	300	$3.00	$900.00
17	P-610	CURB AND GUTTER	LF	1,220	$35.00	$42,700.00
18	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
19	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
20	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
21		CONTINGENCY (20%)	LS	1	$1,872,900.00	$1,872,900.00
		CONSTRUCTION TOTAL				$11,237,485.00
		DESIGN (8%)				$899,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,348,000.00
		PROJECT TOTAL				$12,585,485.00

PROJECT 8

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
HANGARS AND PARKING LOT ON BOTTOM SIDE OF APRON EXPANSION (RIGHT)

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$988,500.00	$988,500.00
2	P-101	HANGAR BUILDING (150X100)	EA	3	$1,950,000.00	$5,850,000.00
3	P-101	HANGAR UTILITIES (150X100)	EA	3	$100,000.00	$300,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$461,900.00	$461,900.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$185,000.00	$185,000.00
6	P-151	CLEARING AND GRUBBING	AC	4	$8,000.00	$32,000.00
7	P-152	EMBANKMENT	CY	256,900	$10.00	$2,569,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,800	$60.00	$108,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	1,360	$140.00	$190,400.00
11	P-602	BITUMINOUS PRIME COAT	GAL	1,750	$3.50	$6,125.00
12	P-603	BITUMINOUS TACK COAT	GAL	500	$3.00	$1,500.00
13	P-610	CURB AND GUTTER	LF	2,341	$35.00	$81,935.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$70,000.00	$70,000.00
15	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
16	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
17		CONTINGENCY (20%)	LS	1	$2,174,800.00	$2,174,800.00
		CONSTRUCTION TOTAL				$13,048,560.00
		DESIGN (8%)				$1,044,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,566,000.00
		PROJECT TOTAL				$14,614,560.00

PROJECT 9

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
CARGO APRON EXPANSION AND CONNECTOR TAXIWAYS - PHASE 4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$4,108,000.00	$4,108,000.00
2	P-102	SAFETY AND SECURITY	LS	1	$200,400.00	$200,400.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$802,000.00	$802,000.00
4	P-151	CLEARING AND GRUBBING	AC	69	$8,000.00	$552,000.00
5	P-152	EMBANKMENT IN PLACE	CY	1,435,200	$10.00	$14,352,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$20,000.00	$20,000.00
7	P-304	CEMENT TREATED BASE COURSE (6")	SY	147,900	$30.00	$4,437,000.00
8	P-501	PORTLAND CEMENT CONCRETE(19")	SY	146,900	$140.00	$20,566,000.00
9	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
10	T-901	SEEDING	AC	23	$1,200.00	$27,600.00
11	T-908	MULCHING	AC	23	$1,000.00	$23,000.00
12		CONTINGENCY (20%)	LS	1	$9,037,600.00	$9,037,600.00
		CONSTRUCTION TOTAL				$54,225,600.00
		PREMIUM FOR NIGHT WORK (25%)				$13,556,400.00
		DESIGN (8%)				$4,338,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$6,507,000.00
		PROJECT TOTAL				$74,289,000.00

PROJECT 10

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
CARGO APRON - HANGARS, PARKING LOTS AND ROADS - PHASE 4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$5,039,700.00	$5,039,700.00
2	P-101	HANGAR BUILDING (200'X900')	SF	180,000	$130.00	$23,400,000.00
3	P-101	HANGAR UTILITIES (200'X900')	LS	1	$100,000.00	$100,000.00
4	P-101	HANGAR BUILDING (200'X900')	SF	180,000	$130.00	$23,400,000.00
5	P-101	HANGAR UTILITIES (200'X900')	LS	1	$100,000.00	$100,000.00
6	P-102	SAFETY AND SECURITY	LS	1	$245,800.00	$245,800.00
7	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$983,300.00	$983,300.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	12,700	$60.00	$762,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	7,900	$140.00	$1,106,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	12,500	$3.50	$43,750.00
12	P-603	BITUMINOUS TACK COAT	GAL	4,100	$3.00	$12,300.00
13	P-610	CURB AND GUTTER	LF	5,400	$35.00	$189,000.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
15	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
16	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
17		CONTINGENCY (20%)	LS	1	$11,087,300.00	$11,087,300.00
		CONSTRUCTION TOTAL				$66,523,550.00
		DESIGN (8%)				$5,322,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$7,983,000.00
		PROJECT TOTAL				$74,506,550.00

PROJECT 11

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
PROPOSED CARGO TAXIWAY NORTHWEST OF RUNWAY

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,461,500.00	$2,461,500.00
2	P-101	PAVMENT REMOVAL	SY	8000	$6.00	$48,000.00
3	P-102	SAFETY AND SECURITY	LS	1	$120,100.00	$120,100.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$480,300.00	$480,300.00
5	P-152	CLEARING AND GRUBBING	AC	1	$8,000.00	$8,000.00
6	P-152	EMBANKMENT	CY	424,000	$8.00	$3,392,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$25,000.00	$25,000.00
8	P-304	CEMENT TREATED BASE COURSE (6")	SY	117,000	$60.00	$7,020,000.00
9	P-501	PORTLAND CEMENT CONCRETE (12")	SY	73,000	$100.00	$7,300,000.00
10	P-501	PORTLAND CEMENT CONCRETE (19")	SY	42,700	$140.00	$5,978,000.00
11	P-620	AIRFIELD MARKING	SF	9,400	$2.00	$18,800.00
12	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
13	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
14	D-701	MISCELLANOUS DRAINAGE	LS	1	$75,000.00	$75,000.00
15	L-108	CABLE TRENCHING	LF	7,200	$2.00	$14,400.00
16	L-108	#8, 5KV, TYPE 'C' CABLE	LF	8,900	$2.00	$17,800.00
17	L-108	#6, BARE COPPER CABLE COUNTERPOISE	LF	8,900	$1.85	$16,465.00
18	L-110	4" - 4 WAY ELECTRICAL DUCT CONCRETE ENCASED	LF	200	$65.00	$13,000.00
20	L-125	TAXIWAY LIGHTS (LED)	EA	44	$1,500.00	$66,000.00
21	L-125	AIRFIELD GUIDANCE SIGN	EA	4	$5,000.00	$20,000.00
22		CONTINGENCY (20%)	LS	1	$5,415,300.00	$5,415,300.00
		CONSTRUCTION TOTAL				$32,491,865.00
		PREMIUM FOR NIGHT WORK (15%)				$4,873,779.75
		DESIGN (8%)				$2,599,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$3,899,000.00
		PROJECT TOTAL				$41,264,644.75

PROJECT 12

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
LARGE CARGO APRON NORTHWEST OF RUNWAY - PHASE 4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,258,300.00	$2,258,300.00
2	P-102	SAFETY AND SECURITY	LS	1	$110,200.00	$110,200.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$440,600.00	$440,600.00
4	P-151	CLEARING AND GRUBBING	AC	20	$8,000.00	$160,000.00
5	P-152	EMBANKMENT	CY	376,200	$8.00	$3,009,600.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
7	P-304	CEMENT TREATED BASE COURSE (6")	SY	94,000	$60.00	$5,640,000.00
8	P-501	PORTLAND CEMENT CONCRETE (19")	SY	94,000	$140.00	$13,160,000.00
9	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$4,968,200.00	$4,968,200.00
		CONSTRUCTION TOTAL				$29,809,100.00
		DESIGN (8%)				$2,385,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$3,577,000.00
		PROJECT TOTAL				$33,386,100.00

PROJECT 13

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
SMALL CARGO APRON NORTHWEST OF RUNWAY - PHASE 4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$662,200.00	$662,200.00
2	P-102	SAFETY AND SECURITY	LS	1	$309,400.00	$309,400.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$123,800.00	$123,800.00
4	P-151	CLEARING AND GRUBBING	AC	10	$8,000.00	$80,000.00
5	P-152	EMBANKMENT	CY	105,800	$8.00	$846,400.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$10,000.00	$10,000.00
7	P-304	CEMENT TREATED BASE COURSE (6")	SY	26,000	$60.00	$1,560,000.00
8	P-501	PORTLAND CEMENT CONCRETE (19")	SY	26,000	$140.00	$3,640,000.00
9	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
10	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
11	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
12		CONTINGENCY (20%)	LS	1	$1,456,800.00	$1,456,800.00
		CONSTRUCTION TOTAL				$8,740,800.00
		DESIGN (8%)				$699,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,049,000.00
		PROJECT TOTAL				$9,789,800.00

PROJECT 14

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
NORTHWEST CARGO APRON - 3 HANGARS, PARKING LOTS AND ROADS - PHASE 4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$4,887,400.00	$4,887,400.00
2	P-101	HANGAR BUILDING (200'X550')	SF	110,000	$130.00	$14,300,000.00
3	P-101	HANGAR UTILITIES (200'X550')	LS	1	$100,000.00	$100,000.00
4	P-101	HANGAR BUILDING (200'X550')	SF	110,000	$130.00	$14,300,000.00
5	P-101	HANGAR UTILITIES (200'X550')	LS	1	$100,000.00	$100,000.00
6	P-102	HANGAR BUILDING (200'X550')	SF	110,000	$130.00	$14,300,000.00
7	P-103	HANGAR UTILITIES (200'X550')	LS	1	$100,000.00	$100,000.00
8	P-102	SAFETY AND SECURITY	LS	1	$238,400.00	$238,400.00
9	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$953,600.00	$953,600.00
10	P-151	CLEARING AND GRUBBING	AC	14	$8,000.00	$112,000.00
11	P-152	EMBANKMENT IN PLACE	CY	244,300	$10.00	$2,443,000.00
12	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
13	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	9,200	$60.00	$552,000.00
14	NCDOT	ASPHALT PAVEMENT (4")	TN	7,200	$140.00	$1,008,000.00
15	P-602	BITUMINOUS PRIME COAT	GAL	9,000	$3.50	$31,500.00
16	P-603	BITUMINOUS TACK COAT	GAL	2,800	$3.00	$8,400.00
17	P-610	CURB AND GUTTER	LF	7,800	$35.00	$273,000.00
18	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
19	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
20	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
21		CONTINGENCY (20%)	LS	1	$10,752,300.00	$10,752,300.00
		CONSTRUCTION TOTAL				$64,514,000.00
		DESIGN (8%)				$5,161,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$7,742,000.00
		PROJECT TOTAL				$72,256,000.00

PROJECT 15

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
NORTHWEST CARGO APRON - HANGARS, PARKING LOT AND ROAD - PHASE 4 LEFT TOP

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$3,219,700.00	$3,219,700.00
2	P-101	HANGAR BUILDING (250'X850')	SF	212,500	$130.00	$27,625,000.00
3	P-101	HANGAR UTILITIES (250'X850')	LS	1	$100,000.00	$100,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$1,504,500.00	$1,504,500.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$601,800.00	$601,800.00
6	P-151	CLEARING AND GRUBBING	AC	8	$8,000.00	$64,000.00
7	P-152	EMBANKMENT	CY	138,200	$10.00	$1,382,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	4,400	$60.00	$264,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	3,600	$140.00	$504,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	4,300	$3.50	$15,050.00
12	P-603	BITUMINOUS TACK COAT	GAL	2,800	$3.00	$8,400.00
13	P-610	CURB AND GUTTER	LF	2,100	$35.00	$73,500.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
15	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
16	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
17		CONTINGENCY (20%)	LS	1	$7,083,300.00	$7,083,300.00
		CONSTRUCTION TOTAL				$42,499,650.00
		DESIGN (8%)				$3,400,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$5,100,000.00
		PROJECT TOTAL				$47,599,650.00

PROJECT 16

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
AVIATION SUPPORT BUILDINGS, PARKING LOT AND ROAD

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$967,900.00	$967,900.00
2	P-101	HANGAR BUILDING (100'X50')	EA	4	$1,950,000.00	$7,800,000.00
3	P-101	HANGAR UTILITIES (100'X50')	EA	4	$100,000.00	$400,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$452,300.00	$452,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$180,900.00	$180,900.00
6	P-151	CLEARING AND GRUBBING	AC	2	$8,000.00	$14,240.00
7	P-152	EMBANKMENT IN PLACE	CY	31,700	$10.00	$317,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,000	$60.00	$120,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	1,600	$140.00	$224,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	1,900	$3.50	$6,650.00
12	P-603	BITUMINOUS TACK COAT	GAL	600	$3.00	$1,800.00
13	P-610	CURB AND GUTTER	LF	1,700	$35.00	$59,500.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
15	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
16	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
17		CONTINGENCY (20%)	LS	1	$2,129,300.00	$2,129,300.00
		CONSTRUCTION TOTAL				$12,775,790.00
		DESIGN (8%)				$1,022,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,533,000.00
		PROJECT TOTAL				$14,308,790.00

PROJECT 17

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
FUEL FARM EXPANSION - PHASE 4

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$141,300.00	$141,300.00
2	P-102	SAFETY AND SECURITY	LS	1	$66,000.00	$66,000.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$26,400.00	$26,400.00
4	P-151	CLEARING AND GRUBBING	AC	3	$8,000.00	$24,000.00
5	P-152	EMBANKMENT	CY	48,000	$10.00	$480,000.00
6	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
7	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,200	$60.00	$72,000.00
8	NCDOT	ASPHALT PAVEMENT (4")	TN	960	$140.00	$134,400.00
9	P-602	BITUMINOUS PRIME COAT	GAL	1,200	$3.50	$4,200.00
10	P-603	BITUMINOUS TACK COAT	GAL	400	$3.00	$1,200.00
11	G-101	FUEL FARM INSTALLATION	LS	1	$520,000.00	$520,000.00
12	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
13	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
14	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
15		CONTINGENCY (20%)	LS	1	$310,800.00	$310,800.00
		CONSTRUCTION TOTAL				$1,864,700.00
		DESIGN (8%)				$149,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$224,000.00
		PROJECT TOTAL				$2,088,700.00

PROJECT 18

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
NORTHWEST CARGO APRON - HANGAR, PARKING LOT AND ROAD - PHASE 4 RIGHT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$2,517,600.00	$2,517,600.00
2	P-101	HANGAR BUILDING (250'X850')	SF	160,000	$130.00	$20,800,000.00
3	P-101	HANGAR UTILITIES (250'X850')	LS	1	$100,000.00	$100,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$1,176,500.00	$1,176,500.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$470,600.00	$470,600.00
6	P-151	CLEARING AND GRUBBING	AC	9	$8,000.00	$72,000.00
7	P-152	EMBANKMENT IN PLACE	CY	156,900	$10.00	$1,569,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	4,900	$60.00	$294,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	3,600	$140.00	$504,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	4,400	$3.50	$15,400.00
12	P-603	BITUMINOUS TACK COAT	GAL	1,400	$3.00	$4,200.00
13	P-610	CURB AND GUTTER	LF	2,400	$35.00	$84,000.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
15	T-901	SEEDING	AC	3	$1,200.00	$3,600.00
16	T-908	MULCHING	AC	3	$1,000.00	$3,000.00
17		CONTINGENCY (20%)	LS	1	$5,538,800.00	$5,538,800.00
		CONSTRUCTION TOTAL				$33,232,700.00
		DESIGN (8%)				$2,659,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$3,988,000.00
		PROJECT TOTAL				$37,220,700.00

PROJECT 19

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
SMALL CARGO APRON NORTHWEST OF RUNWAY - PHASE 4 - HANGAR AND PARKING LOT

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,537,200.00	$1,537,200.00
2	P-101	HANGAR BUILDING (200'X500')	SF	100,000	$130.00	$13,000,000.00
3	P-101	HANGAR UTILITIES (250'X850')	LS	1	$100,000.00	$100,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$718,300.00	$718,300.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$287,300.00	$287,300.00
6	P-151	CLEARING AND GRUBBING	AC	9	$8,000.00	$72,000.00
7	P-152	EMBANKMENT IN PLACE	CY	85,400	$10.00	$854,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$30,000.00	$30,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,300	$60.00	$78,000.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	1,000	$140.00	$140,000.00
11	P-602	BITUMINOUS PRIME COAT	GAL	1,200	$3.50	$4,200.00
12	P-603	BITUMINOUS TACK COAT	GAL	400	$3.00	$1,200.00
13	P-610	CURB AND GUTTER	LF	1,800	$35.00	$63,000.00
14	D-701	MISCELLANEOUS DRAINAGE	LS	1	$20,000.00	$20,000.00
15	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
16	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
17		CONTINGENCY (20%)	LS	1	$3,381,900.00	$3,381,900.00
		CONSTRUCTION TOTAL				$20,291,500.00
		DESIGN (8%)				$1,623,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$2,435,000.00
		PROJECT TOTAL				$22,726,500.00

PROJECT 20

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 7, 2018

20+ YEAR ENGINEERS ESTIMATE
ENTRANCE ROAD TO TERMINAL, ROAD TO AND FROM GENERAL AVIATION

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$483,700.00	$483,700.00
2	P-101	BRIDGE	LS	1	$1,000,000.00	$1,000,000.00
3	P-102	ROAD SIGNAGE	LS	1	$50,000.00	$50,000.00
4	P-102	SAFETY AND SECURITY	LS	1	$226,000.00	$226,000.00
5	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$90,400.00	$90,400.00
6	P-151	CLEARING AND GRUBBING	AC	15	$8,000.00	$120,000.00
7	P-152	EMBANKMENT IN PLACE	CY	136,900	$10.00	$1,369,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	6,760	$60.00	$405,600.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	5,160	$140.00	$722,400.00
11	P-602	BITUMINOUS PRIME COAT	GAL	6,640	$3.50	$23,240.00
12	P-603	BITUMINOUS TACK COAT	GAL	2,000	$3.00	$6,000.00
13	P-610	CURB AND GUTTER	LF	14,800	$35.00	$518,000.00
14	P-620	PAVEMENT MARKING	SF	16,200	$2.00	$32,400.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$100,000.00	$100,000.00
16	L-110	MISCELLANEOUS ELECTRICAL	LS	1	$100,000.00	$100,000.00
17	T-901	SEEDING	AC	11	$1,200.00	$13,200.00
18	T-908	MULCHING	AC	11	$1,000.00	$11,000.00
19		CONTINGENCY (20%)	LS	1	$1,064,200.00	$1,064,200.00
		CONSTRUCTION TOTAL				$6,385,140.00
		DESIGN (8%)				$511,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$766,000.00
		PROJECT TOTAL				$7,151,140.00

PROJECT 21

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
CARGO APRON EXPANSION -NORTHEAST

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$1,281,300.00	$1,281,300.00
2	P-101	PAVEMENT REMOVAL (ASPHALT)	SY	20,500	$9.00	$184,500.00
3	P-102	SAFETY AND SECURITY	LS	1	$598,700.00	$598,700.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$239,500.00	$239,500.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	10,200	$8.00	$81,600.00
6	P-152	ROCK EXCAVATION	CY	29,200	$50.00	$1,460,000.00
7	P-152	ROCK EXCAVATION FOR TRENCHING	CY	3,200	$100.00	$320,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$20,000.00	$20,000.00
9	P-304	CEMENT TREATED BASE COURSE (6")	SY	58,600	$30.00	$1,758,000.00
10	P-501	PORTLAND CONCRETE CEMENT (19")	SY	58,200	$140.00	$8,148,000.00
12	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
13	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
14		CONTINGENCY (20%)	LS	1	$2,818,800.00	$2,818,800.00
		CONSTRUCTION TOTAL				$16,912,600.00
		DESIGN (8%)				$1,353,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$2,030,000.00
		PROJECT TOTAL				$18,942,600.00

PROJECT 22

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
CARGO APRON - NORTHEAST (LEFT SIDE)- HANGAR AND PARKING

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$800,400.00	$800,400.00
2	P-101	PAVEMENT REMOVAL	SY	20,500	$9.00	$184,500.00
3	P-101	HANGAR BUILDING (125'X400')	SF	50,000	$130.00	$6,500,000.00
4	P-101	HANGAR UTILITIES (125'X400')	LS	1	$100,000.00	$100,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$374,000.00	$374,000.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$149,600.00	$149,600.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	1,400	$8.00	$11,200.00
8	P-152	ROCK EXCAVATION	CY	1,700	$50.00	$85,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	200	$100.00	$20,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
11	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	2,300	$60.00	$138,000.00
12	NCDOT	ASPHALT PAVEMENT (4")	TN	1,900	$140.00	$266,000.00
13	P-602	BITUMINOUS PRIME COAT	GAL	2,300	$3.50	$8,050.00
14	P-603	BITUMINOUS TACK COAT	GAL	700	$3.00	$2,100.00
15	P-610	CURB AND GUTTER	LF	1,800	$35.00	$63,000.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
17	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
18	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
19		CONTINGENCY (20%)	LS	1	$1,760,800.00	$1,760,800.00
		CONSTRUCTION TOTAL				$10,564,850.00
		DESIGN (8%)				$845,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$1,268,000.00
		PROJECT TOTAL				$11,832,850.00

PROJECT 23

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
CARGO APRON - NORTHEAST (LEFT SIDE)- HANGAR AND PARKING

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$582,200.00	$582,200.00
2	P-101	PAVEMENT REMOVAL	SY	400	$9.00	$3,600.00
3	P-101	HANGAR BUILDING	SF	37,500	$130.00	$4,875,000.00
4	P-101	HANGAR UTILITIES	LS	1	$100,000.00	$100,000.00
5	P-102	SAFETY AND SECURITY	LS	1	$272,100.00	$272,100.00
6	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$108,800.00	$108,800.00
7	P-152	UNCLASSIFIED EXCAVATION	CY	800	$8.00	$6,400.00
8	P-152	ROCK EXCAVATION	CY	1,000	$50.00	$50,000.00
9	P-152	ROCK EXCAVATION FOR TRENCHING	CY	110	$100.00	$11,000.00
10	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
11	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	1,400	$60.00	$84,000.00
12	NCDOT	ASPHALT PAVEMENT (4")	TN	1,100	$140.00	$154,000.00
13	P-602	BITUMINOUS PRIME COAT	GAL	1,400	$3.50	$4,900.00
14	P-603	BITUMINOUS TACK COAT	GAL	440	$3.00	$1,320.00
15	P-610	CURB AND GUTTER	LF	1,400	$35.00	$49,000.00
16	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
17	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
18	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
19		CONTINGENCY (20%)	LS	1	$1,280,900.00	$1,280,900.00
		CONSTRUCTION TOTAL				$7,685,420.00
		DESIGN (8%)				$615,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$922,000.00
		PROJECT TOTAL				$8,607,420.00

PROJECT 24

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
ROAD TO FUEL FARM, CARGO APRON AND LOGISTICS PARK

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$180,900.00	$180,900.00
2	P-101	PAVMENT REMOVAL	SY	4,400	$9.00	$39,600.00
3	P-102	SAFETY AND SECURITY	LS	1	$84,500.00	$84,500.00
4	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$33,800.00	$33,800.00
5	P-152	UNCLASSIFIED EXCAVATION	CY	3,600	$8.00	$28,800.00
6	P-152	ROCK EXCAVATION	CY	3,700	$50.00	$185,000.00
7	P-152	ROCK EXCAVATION FOR TRENCHING	CY	410	$100.00	$41,000.00
8	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$100,000.00	$100,000.00
9	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	5,130	$60.00	$307,800.00
10	NCDOT	ASPHALT PAVEMENT (4")	TN	4,120	$140.00	$576,800.00
11	P-602	BITUMINOUS PRIME COAT	GAL	5,040	$3.50	$17,640.00
12	P-603	BITUMINOUS TACK COAT	GAL	1,600	$3.00	$4,800.00
13	P-610	CURB AND GUTTER	LF	9,540	$35.00	$333,900.00
14	P-620	PAVEMENT MARKING	SF	1,400	$2.00	$2,800.00
15	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
16	T-901	SEEDING	AC	1	$1,200.00	$1,200.00
17	T-908	MULCHING	AC	1	$1,000.00	$1,000.00
18		CONTINGENCY (20%)	LS	1	$397,900.00	$397,900.00
		CONSTRUCTION TOTAL				$2,387,440.00
		DESIGN (8%)				$191,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$286,000.00
		PROJECT TOTAL				$2,673,440.00

PROJECT 25

GREENVILLE-SPARTANBURG INTERNATIONAL AIRPORT (GSP)
AIRPORT LAYOUT PLAN UPDATE

November 26, 2018

20+ YEAR ENGINEERS ESTIMATE
FUEL FARM EXPANSION - NEAR LOGISTICS PARK

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED TOTAL
1	105	MOBILIZATION (10%)	LS	1	$206,300.00	$206,300.00
2	P-102	SAFETY AND SECURITY	LS	1	$96,400.00	$96,400.00
3	P-104	PROJECT SURVEY AND STAKEOUT	LS	1	$38,600.00	$38,600.00
4	P-152	UNCLASSIFIED EXCAVATION	CY	3,400	$8.00	$27,200.00
5	P-152	ROCK EXCAVATION	CY	4,100	$50.00	$205,000.00
6	P-152	ROCK EXCAVATION FOR TRENCHING	CY	460	$100.00	$46,000.00
7	P-156	SEDIMENT AND EROSION CONTROL	LS	1	$50,000.00	$50,000.00
8	NCDOT 520	CRUSHED AGGREGATE BASE COURSE (10")	CY	5,700	$60.00	$342,000.00
9	NCDOT	ASPHALT PAVEMENT (4")	TN	4,700	$140.00	$658,000.00
10	P-602	BITUMINOUS PRIME COAT	GAL	5,600	$3.50	$19,600.00
11	P-603	BITUMINOUS TACK COAT	GAL	1,900	$3.00	$5,700.00
12	G-101	FUEL FARM INSTALLATION	LS	1	$520,000.00	$520,000.00
13	D-701	MISCELLANEOUS DRAINAGE	LS	1	$50,000.00	$50,000.00
14	T-901	SEEDING	AC	2	$1,200.00	$2,400.00
15	T-908	MULCHING	AC	2	$1,000.00	$2,000.00
16		CONTINGENCY (20%)	LS	1	$453,800.00	$453,800.00
		CONSTRUCTION TOTAL				$2,723,000.00
		DESIGN (8%)				$218,000.00
		BIDDING, CA, INSPECTION, TESTING (12%)				$327,000.00
		PROJECT TOTAL				$3,050,000.00